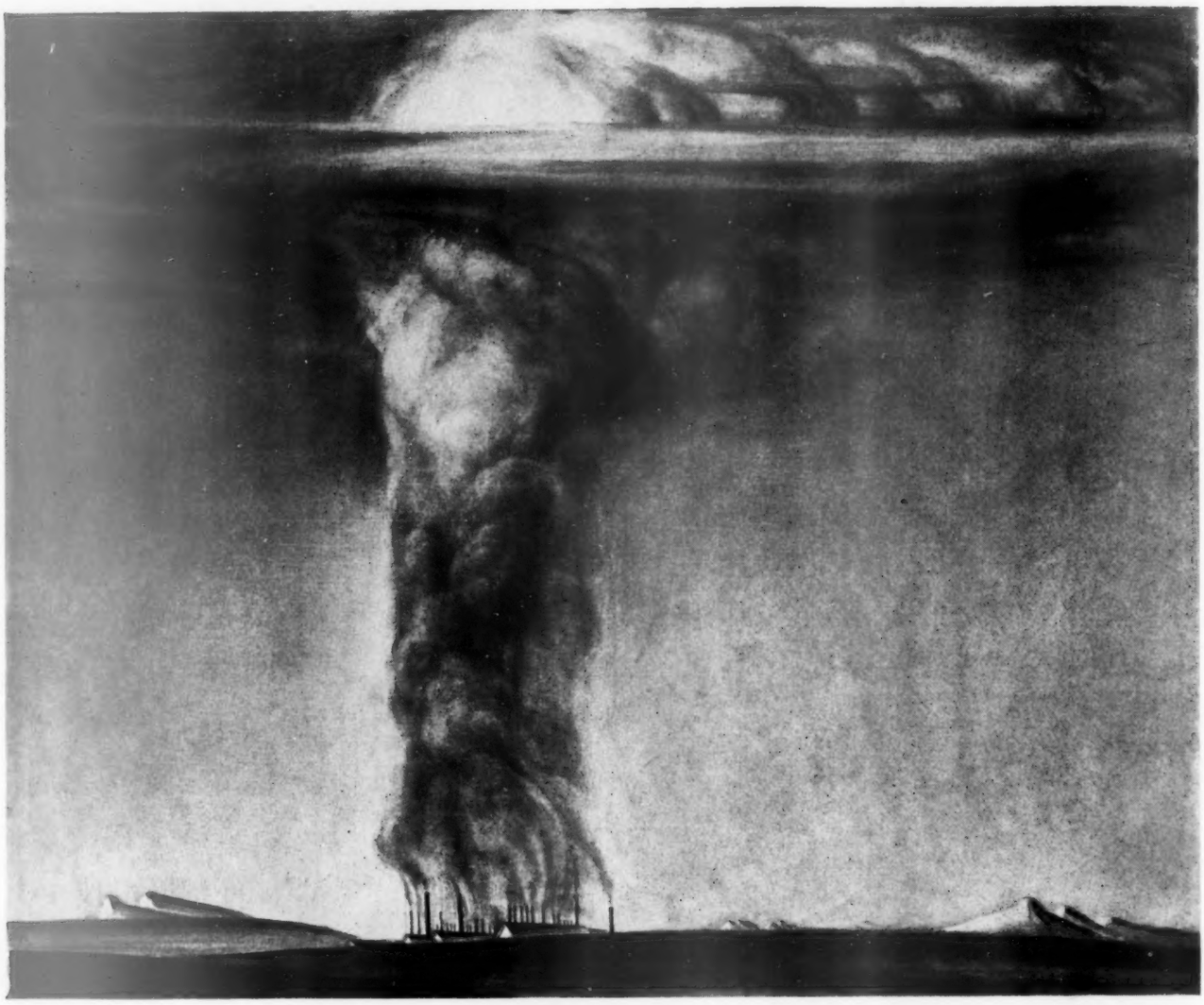
PIT AND QUARRY

APR 22 1937

NOVEMBER, 1936

Diesel Power in the Industry . . . Lime Is By-Product of Dry-Ice Plant . . . Comparative Trends in the Use of Construction Materials . . . A 5-Year Analysis of Accidents in the Cement Industry



TWO AND ONE HALF MILLION CUBIC FEET OF SMOKE PER MINUTE...

What you see in smoke is solid—micronic* particles whose ratio of mass to surface area is so small that they float in a rising draft of hot gas. Usually these particles are carbon . . . but they may be silica . . . potash . . . zinc . . . copper . . . anything . . . even gold. Ultimately they all come to earth . . . widely dispersed . . . as a menace to health and property, or as an industrial loss, or both.

Think of catching these countless billions of smoke particles one by one . . . of cleaning waste gases instantly . . . of collecting acid or alkali fume . . . so that stacks emit only a barely visible wisp of water vapor instead of belching forth dense clouds of sinister smoke.

Nature supplies and man applies the forces to consummate this miracle, even when millions of cubic feet of smoke must be handled in a minute. Electrical Precipitation by the Cottrell Process has been successfully used for years in plants of various kinds and in all industrial countries. Thousands of tons of solids per day are being recovered in these plants, often realizing commercial values that soon pay for the installation, and showing continuous profits thereafter.

As specialists in dust and fume control for more than a quarter of a century, our engineers will be glad to consider your problems if you will give us the facts in the case.

**1 Micron is equal to 1/25,400 of an inch.*

WESTERN PRECIPITATION COMPANY 1016 WEST NINTH STREET, LOS ANGELES, CALIFORNIA
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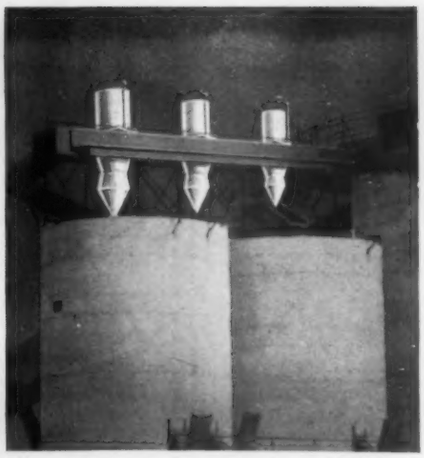
COTTRELL ELECTRICAL PRECIPITATORS — PEEBLES SPRAY DRYERS — MULTICLONES

PIT AND QUARRY, November, 1936. Vol. 29, No. 5. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price: $2 for 3 years, $1 for 1 year in the U. S. and possessions, Canada, and Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter November 28, 1932, at the Post-Office at Chicago, Ill., under the Act of March 3, 1879.



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The complete Link-Belt line includes every form of mechanical handling and preparation equipment—for washing, grading, elevating, conveying; as well as excavating.

Link-Belt has brought to the highest point of standardization, commensurate with sound engineering, the elements of handling and preparation equipment, and the positive power transmitting units for them. Link-Belt designs offer economy and flexibility of layout, with equipment developed for specialized services. Send for catalog No. 1240.

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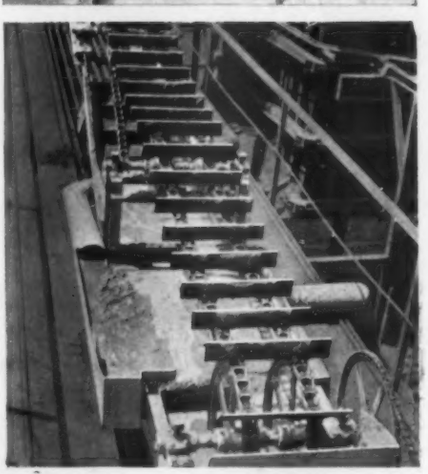

NEW *Bucyrus-Erie* 19-B

5/8-YARD CONVERTIBLE EXCAVATOR » »

With any front-end equipment, the new Bucyrus-Erie 19-B is the last word in 5/8-yard output, performance and operating economy.

This new 5/8-yard winner brings you the same high-speed digging cycle; easy convertibility; rugged construction; maneuverability; and dependable, economical day-in-and-day-out operation that have made its smaller companion machine, the famous 3/8-yard 10-B, the fastest-selling excavator in the world.

Write today, or mail convenient coupon below, for full details on the NEW 19-B 5/8-yard.

BUCYRUS-ERIE CO., SOUTH MILWAUKEE, WIS., U. S. A.
GENTLEMEN: I am interested in the NEW 5/8-YARD 19-B.
☐ Please send me literature or ☐ have a representative show me the PICTORIAL PRESENTATION OF FACTS ON THIS NEW WINNER. PQ

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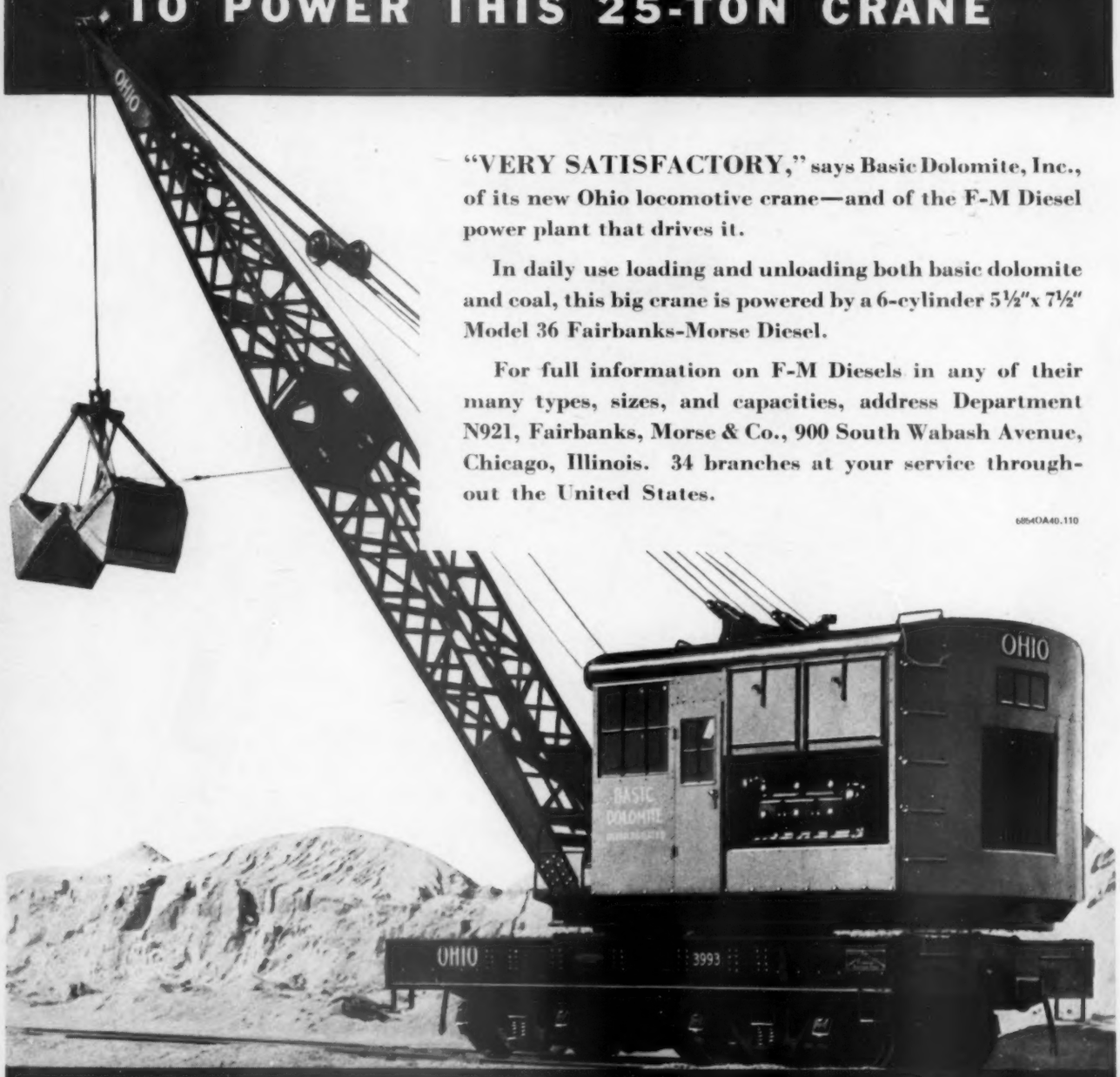
EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN, U.S.A.

Ohio Locomotive Crane Co. Picks an F-M 36

TO POWER THIS 25-TON CRANE



"VERY SATISFACTORY," says Basic Dolomite, Inc., of its new Ohio locomotive crane—and of the F-M Diesel power plant that drives it.

In daily use loading and unloading both basic dolomite and coal, this big crane is powered by a 6-cylinder 5½"x 7½" Model 36 Fairbanks-Morse Diesel.

For full information on F-M Diesels in any of their many types, sizes, and capacities, address Department N921, Fairbanks, Morse & Co., 900 South Wabash Avenue, Chicago, Illinois. 34 branches at your service throughout the United States.

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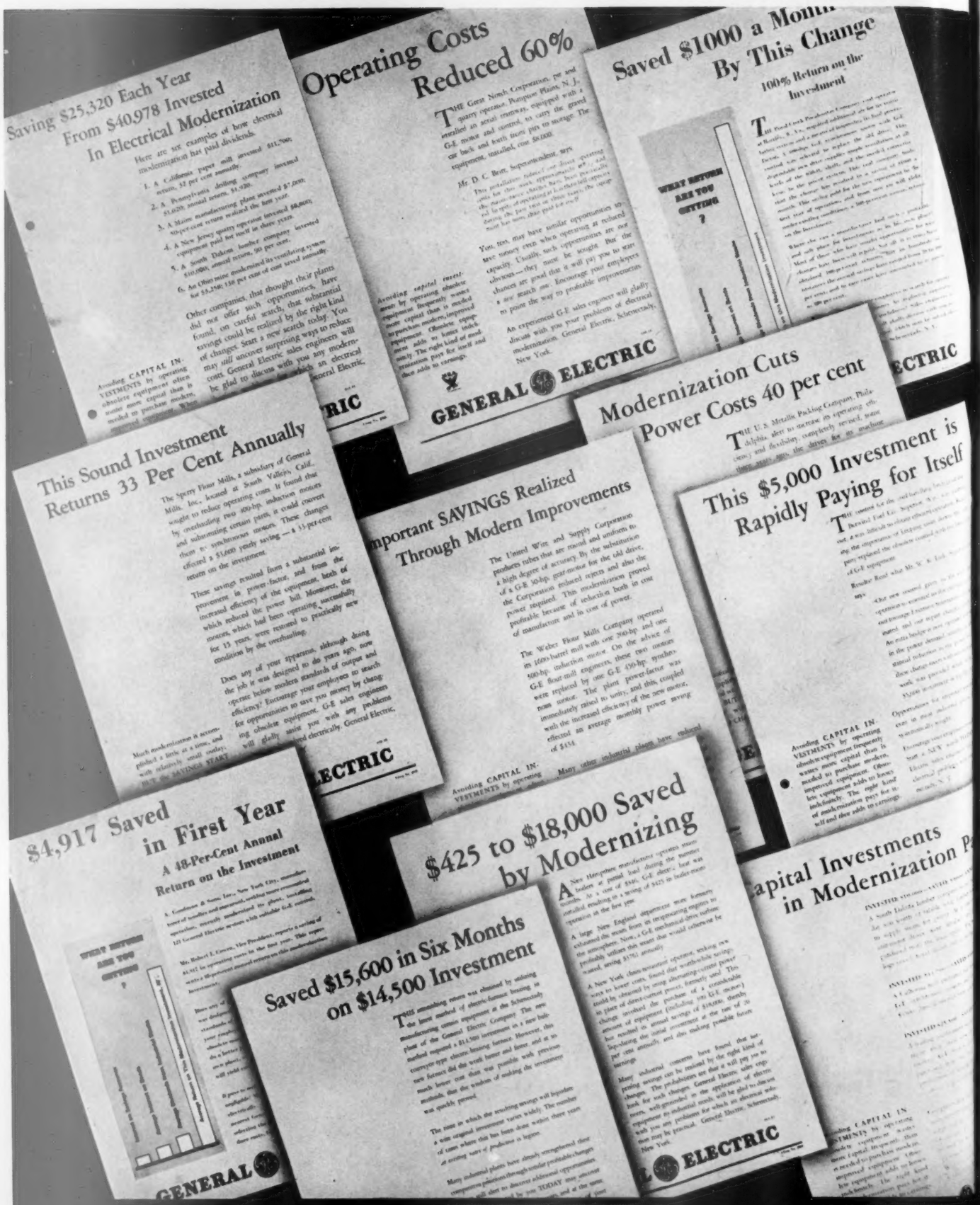
FAIRBANKS-MORSE Diesel Engines

106 YEARS OF PRECISION MANUFACTURING

POWER, PUMPING AND WEIGHING EQUIPMENT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Here are six examples of how electrical modernization has paid dividends.
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5. A South Dakota lumber company invested $10,000; annual return, 50 per cent.
6. An Ohio mine modernized its ventilating system for $3,250; 150 per cent of cost saved annually.
Other companies, that thought their plants did not offer such opportunities, have found, on careful scratch, that substantial savings could be realized by the right kind of changes. Start a new search today. You may still uncover surprising ways to reduce costs. General Electric sales engineers will be glad to discuss with you any modernization which an electrical
Avoiding CAPITAL INVESTMENTS by operating obsolete equipment often wastes more capital than is needed to purchase modern, improved equipment. When
Operating Costs Reduced 60%
THE Great Notch Corporation, pit and quarry operator, Bumpton Plains, N. J., installed an aerial tramway, equipped with a G-E motor and control, to carry the gravel car back and forth from pits to storage. The equipment, installed, cost $6,000.
Mr. D. C. Bett, Superintendent, says
"This installation [tramway] has been operating for two years without interruption and at all times in all weathers. It has been performing the work for which it was designed in a highly satisfactory manner and has more than paid for itself."
Avoiding capital investments by operating obsolete equipment frequently wastes more capital than is needed to purchase modern, improved equipment. Obsolete equipment adds to future trouble. The right kind of modernization pays for itself and then adds to earnings.
You, too, may have similar opportunities to MAY MONEY even when operating at reduced capacity. Usually, such opportunities are not obvious—they must be sought. But the chances are good that it will pay you to start a new search now. Encourage your employees to point the way to profitable improvements.
An experienced G-E sales engineer will gladly discuss with you your problems of electrical modernization. General Electric, Schenectady, New York.
GENERAL ELECTRIC
Saved $1000 a Month By This Change
100% Return on the Investment
THE Flood Creek Production Company, coal operators of Florida, S. Va., completed installation of the latest devices and methods of transporting coal from G-E Factory, Columbus [coal] underground haulage system was selected to replace the old mules. This electrically-driven system includes a 25-hp motor, a 30-hp motor, shaft, and the needed connecting [illegible] of the mine, which [illegible] from the power station. The coal conveyor [illegible] to be the most economical for the purpose. Flood Creek Production Company decided that the new equipment would pay for itself within a year. The saving gained by the new method [illegible] month. The selling price for the new equipment was $1,000. The operations, and from now on will yield a handsome profit. [illegible] conditions a 100-per-cent return on the investment.
Where else can a similar case be found [illegible] profitable and safe place for investments in [illegible] Most of these [illegible] have been well paid. But all [illegible] changes have been well paid. But all [illegible] changes have been well paid. But all [illegible] changes

The Cement Industry, too,

IS MODERNIZING FOR PROFITS

★

AND well it must, to keep pace with the rapidly growing market. Not only has building, both commercial and residential, shown a tremendous increase in the last year, but Federal appropriations for road building (more than $200,000,000) have created a demand for the products of cement and rock-products plants, necessitating not only new facilities but modernization of equipment now in operation.

The advertisements on the opposite page have been taken at random from our series on plant modernization. Each is an example of how one or more companies found it profitable to modernize a plant or process by using General Electric equipment.

You, too, are looking to the future! Are you ready to take advantage of the tremendous possibilities in new construction and road building?

General Electric offers a complete line of equipment to fill every electrical requirement of your plant—motors and control especially designed to meet your particular needs, switchgear, cable, lighting equipment, turbines—engineered and manufactured by the largest producer of electric equipment in the world. Write to the nearest G-E office today. General Electric Company, Schenectady, New York.

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E L E C T R I C

Cut YOUR HAULING COSTS WITH THE "CATERPILLAR" DIESEL POWERED HUG LUGGER

● *One of 3 Model 30 Hug Luggers purchased by Dick Bros. Construction Co., Hazelton, Pa., for strip mining operations.*

● *Model 30 Hug Lugger equipped with a 10 yard special dirt body, with high angle direct reversible double acting power hoist.*

WITH the economy and efficiency of the "Caterpillar" Diesel Engine now available in the Hug Lugger, Hug offers a transportation unit that has established unbelievably low transportation costs in the heavy hauling field.

In addition to the famous "Caterpillar" Diesel Engine, the Hug Lugger offers such outstanding features of construction as an all electric arc welded body, heavy duty full floating rear axle with high traction differential, transmission with 12 speeds forward and 3 reverse providing power and speed to meet any conditions. The Hug set back wheel design with exceptionally short turning radius and many other unusual features of Hug design and construction make the Hug Lugger the world's most outstanding heavy hauling unit.

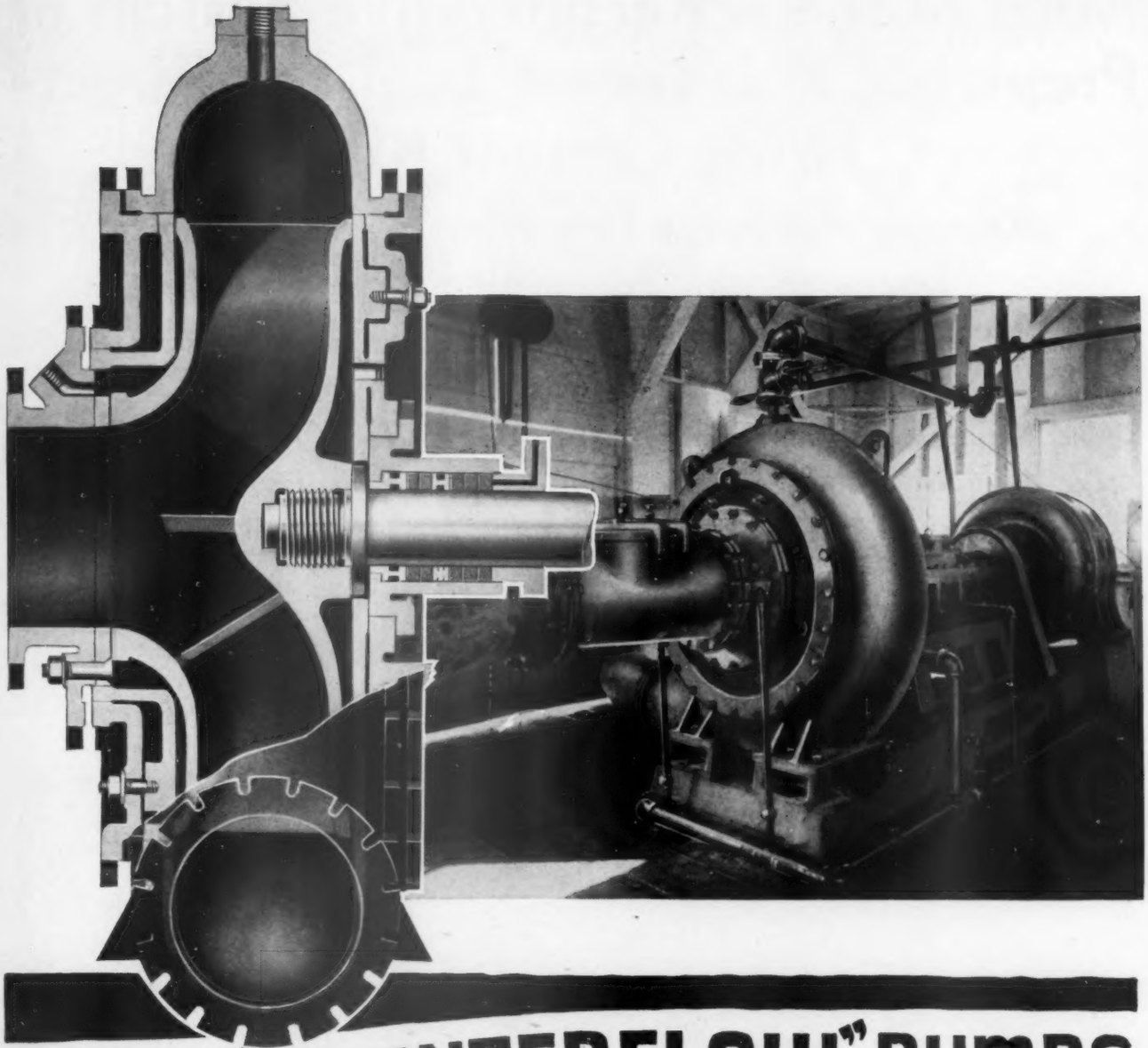
Hug Lugger models are available in 6-8-10 and 12 yard capacities with a wide range of bodies suitable for any dump truck requirement.

Write today for full information on the Hug Lugger line and let us show you how you can cut your hauling costs.

● *Front view of Model 30 Hug Lugger.*

● *Side view of Model 30 Hug Lugger showing set back wheel design.*

THE HUG COMPANY
501 CYPRUS STREET
HIGHLAND, ILL.



AMSCO "COUNTERFLOW" PUMPS

Long recognized as the leading maker of abrasive material handling pumps, AMSCO now offers a major design improvement in the "COUNTERFLOW" Pump. The result of years of experience, the "COUNTERFLOW" Pump combines several new design advantages with the correct application of manganese steel, "the toughest steel known."

The "COUNTERFLOW" Pump features: a wide funnel-mouth impeller; threading of the impeller bore; elimination of internal leakage; *and most important — greatly reduced internal wear* accomplished by providing clear water, under pressure between the impeller shrouds and the shell side plates. This AMSCO feature introduces clear water between the shrouds and plates with a "counter-flow" action, replacing sand-laden water which is a cutting compound, with clear water which is a lubricant — thus the name, the AMSCO "COUNTERFLOW" Pump.

This new design is not only available in all sizes and types of new AMSCO Pumps, but practically all pumps now in service may be converted at nominal cost to take advantage of "COUNTERFLOW" features.

Write for details on AMSCO "COUNTERFLOW" Pumps and how to increase the life of your old pumps by making "COUNTERFLOW" changes!

AMERICAN MANGANESE STEEL COMPANY

Division of American Brake Shoe & Foundry Company

396 East 14th Street, Chicago Heights, Ill.

Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; Oakland, Calif.; Los Angeles, Calif. • Offices in Principal Cities

AMSCO

TRADE MARK REGISTERED

Most Modern Recuperative System of Preparing Pulverized Coal for Direct-Firing Cement Kilns

Kennedy Air-Swept Tube Mill Gearless Type—Equipped with Automatic Level Control

Produces Continuous Supply of Superfine Pulverized Coal for Direct-firing Rotary Kilns

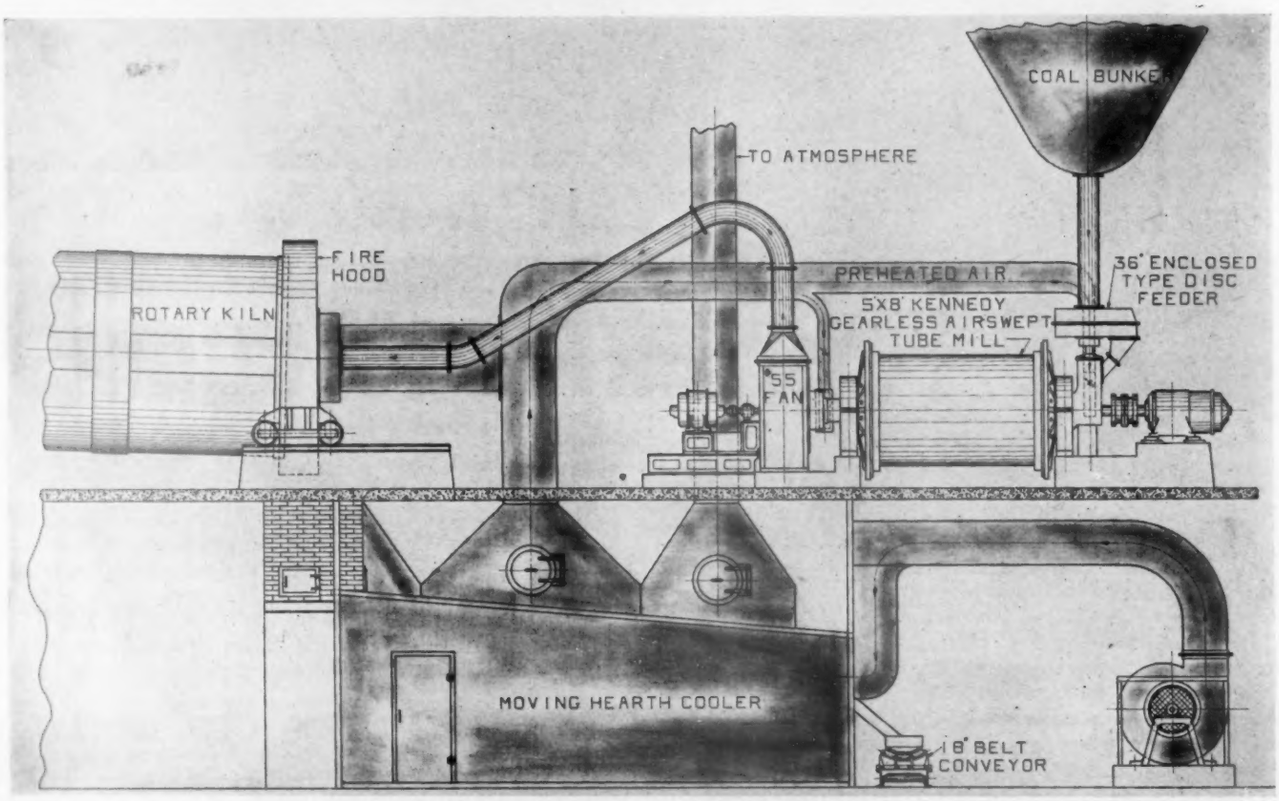
Reduces Coal Preparation Costs 30c to 50c per Ton Over Other Preparation Methods

Increases Kiln Production 5 to 15%

Has Low Power Consumption—16 to 18 K.W.H. per Ton

Has Low Maintenance Cost—Less Than 1c per Ton

NOISELESS - DEPENDABLE - FOOLPROOF



Wire or write for one of our engineers to call without obligation on your part.

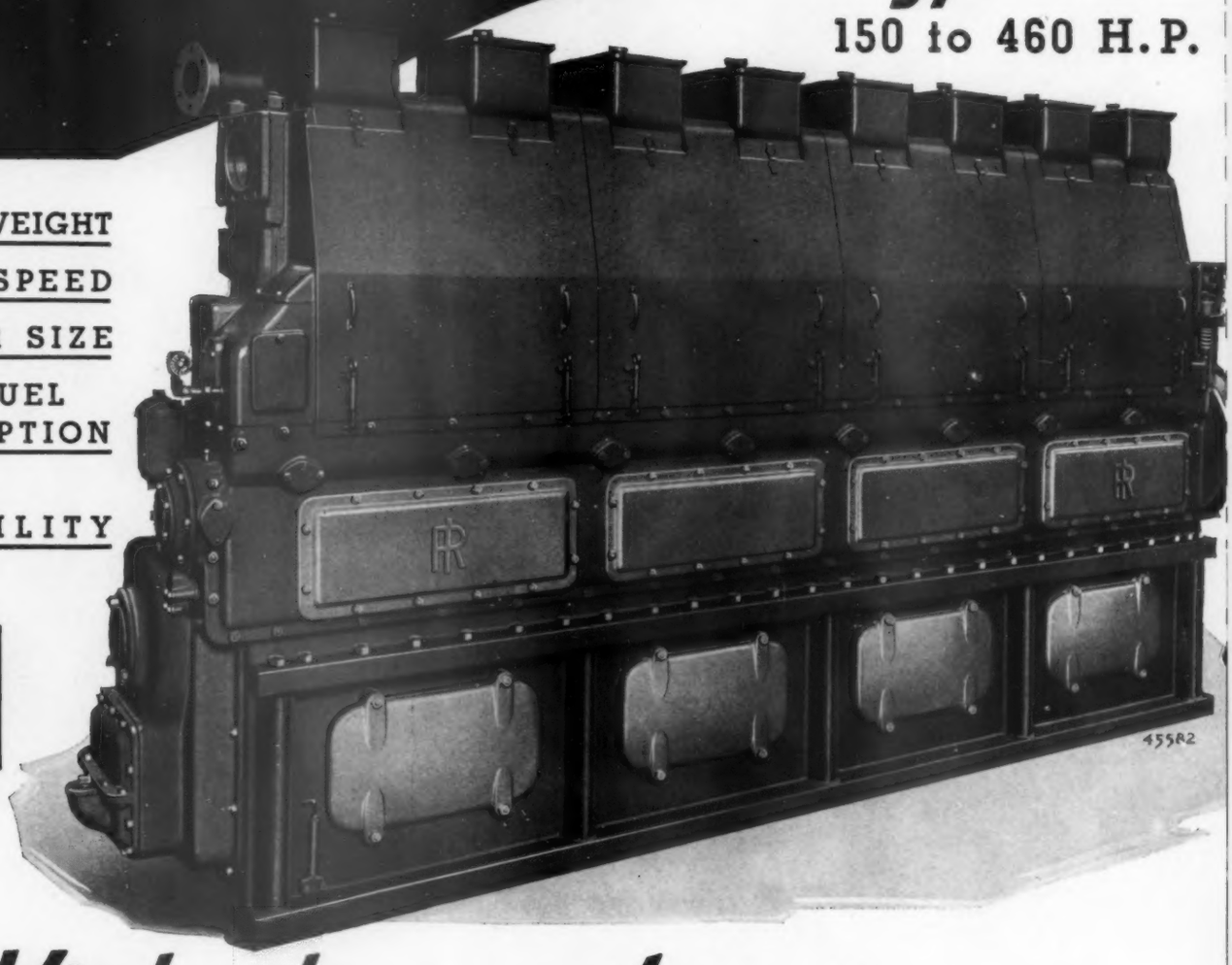
KENNEDY-VAN SAUN MFG. & ENG. CORP.
2 Park Avenue New York, N. Y.
Sales Agents in all Principal Cities of the United States

An Improved Diesel Engine

Type "S"

150 to 460 H.P.

- LIGHTER WEIGHT
- HIGHER SPEED
- SMALLER SIZE
- LOWER FUEL CONSUMPTION
- PROVED RELIABILITY



With these advantages

1. Modern Design—Type S engines have such modern features as full enclosure of the engine, cylinder liners, and full force-feed lubrication. They follow the modern trend to higher speeds and lighter weight but without sacrificing reliability.

2. Lower Fuel Consumption—As low as that of the largest slow-speed engines and about 25% lower than that of high-speed automotive type engines.

3. Lower Installation Costs—The Type S weighs less and requires less space and smaller foundations than slow-speed engines. Installation and transportation costs are therefore much lower.

4. More Efficient Power Transmission—The higher speed makes possible less costly and more efficient generators. Better pulley and gear ratios are possible for most installations.

5. Inexpensive to Maintain—The unit is built for heavy duty service. Records prove its low maintenance expense.

6. A Thoroughly Proved Engine—More than 140 I-R engines of the same bore, stroke and speed are in successful service. Some of these have been in service for 12 years.

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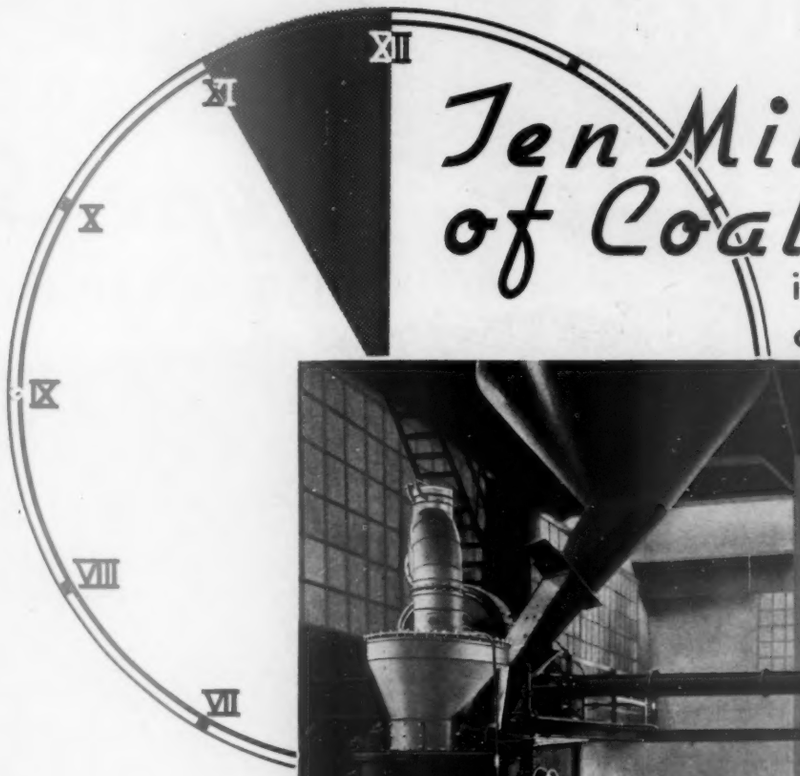

Ten Million Tons of Coal Per Hour

is the rated capacity of RAYMOND MILLS

Raymond BOWL MILL direct-firing a Rotary Kiln in a modern cement plant

It's the tonnage that tells the story!

The preponderance of Raymond mills in powdered coal installations throughout industry reflects the operating efficiency of the equipment and the buying judgment of the plant engineers. They base their mill purchases on production value, just as they base their coal purchases on thermal value.

Raymond responds to this confidence—built up through the years—by the development of the greatest grinding unit of all time—the Raymond BOWL MILL.

This direct-firing unit is now entering its second year with an amazing number of repeat installations, resulting from new records of performance—higher capacities, reduced power costs, longer runs without shutdowns and lower maintenance.

Some of these larger Bowl Mills are doing 12 tons per hour, day after day, month after month of non-stop service. Write for detailed information.

Bowl Mill Catalog sent on request

RAYMOND

BROS. IMPACT PULVERIZER COMPANY

Division of Combustion Engineering Corp., Inc.

1321 North Branch Street, CHICAGO

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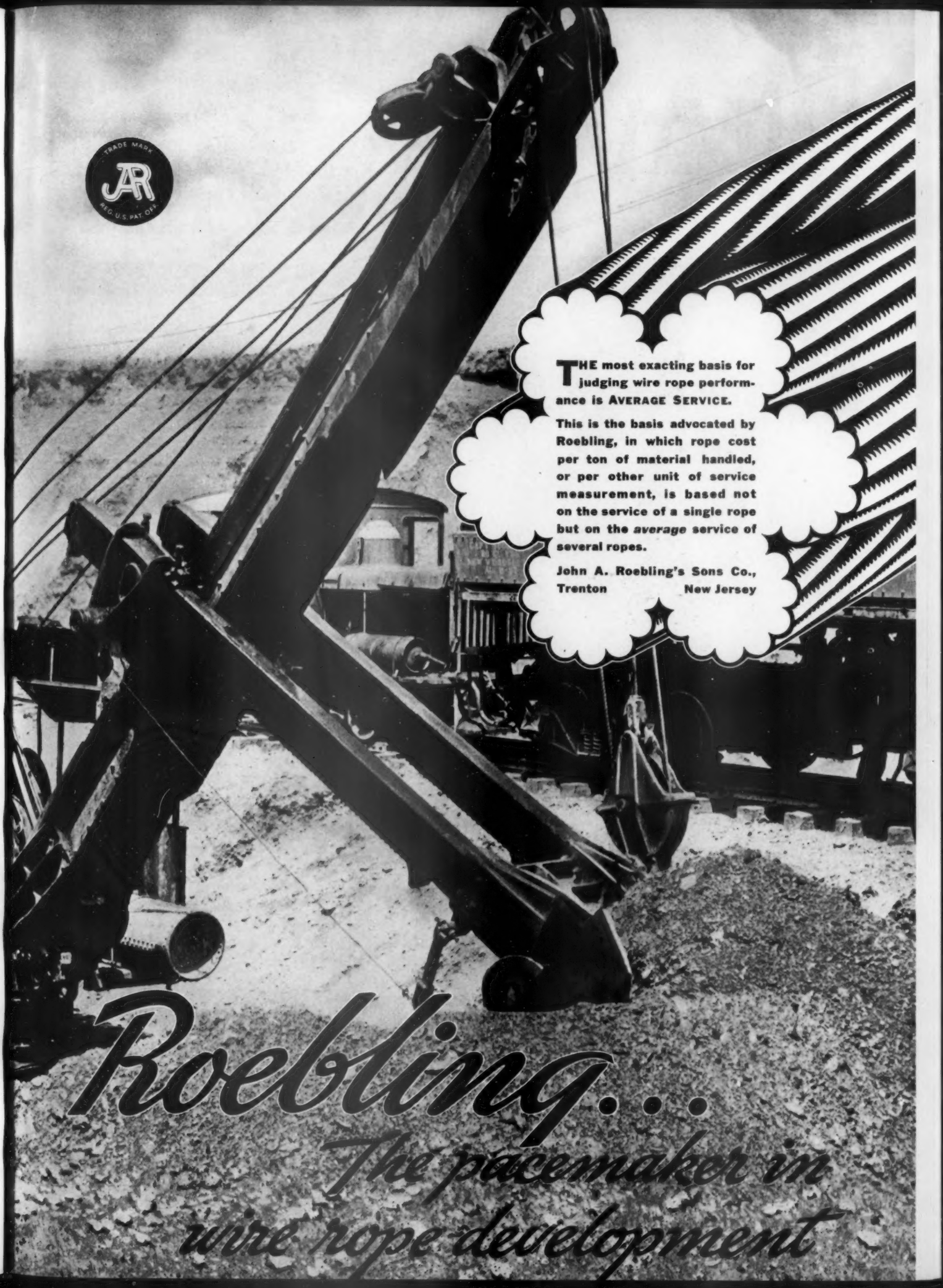
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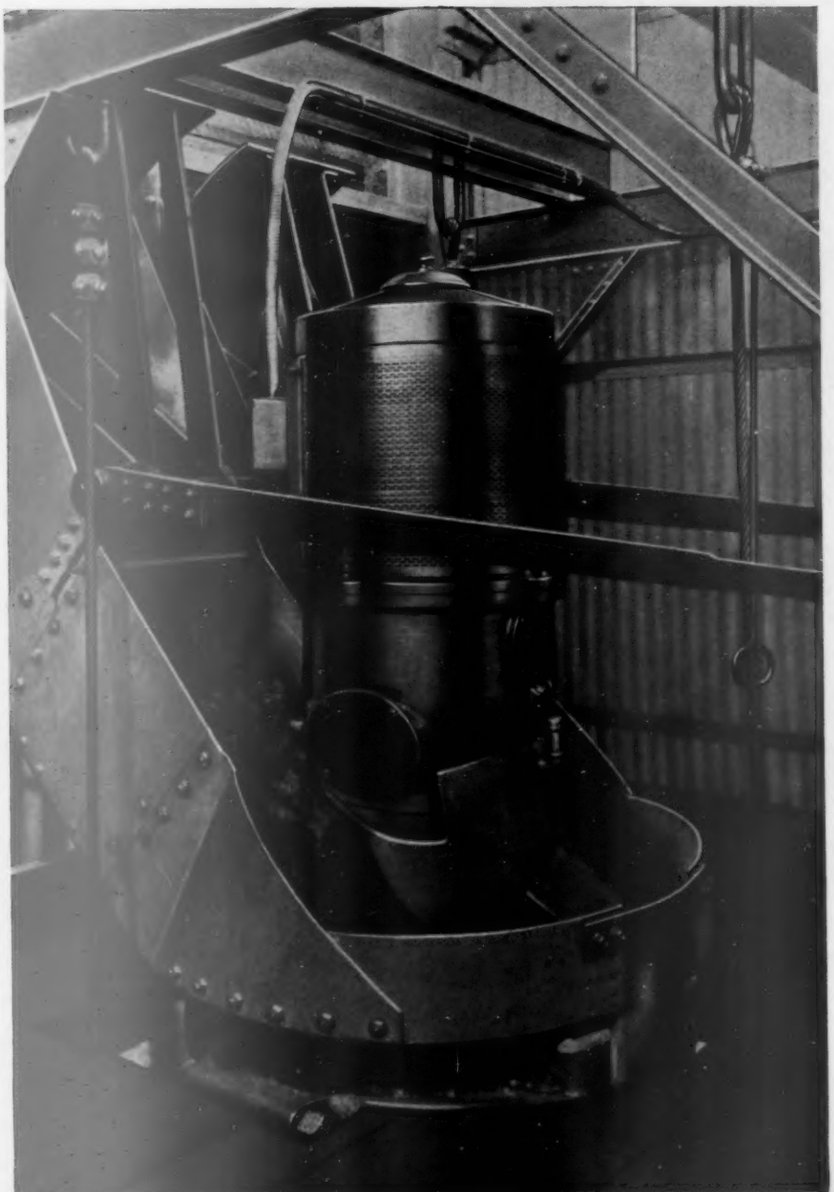
THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.
This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.
John A. Roebling's Sons Co., Trenton New Jersey
Roebling...
The pacemaker in wire rope development

Proven
BY EVERY TEST



A PROMINENT Ohio commercial stone plant made the following tests on an Allis-Chalmers Newhouse Crusher, to prove to their own satisfaction that they had selected the best crusher for their job.

A test, which was of long duration was made on a 10″ Newhouse Crusher driven by a 125 hp, 495 rpm motor. The setting was 9/16″ on the close side with a ½″ throw eccentric. The maximum power input to the motor was 100 hp.

All of the material crushed was passed over two 4′x8′ vibrating screens, set in tandem, with ½″ square openings. This gave a product through this ½″ screen cloth and washed over an ⅛″ square wire which averaged 43 tons an hour for duration of test. This material discharged into a bin by itself and was weighed. The oversize and throughs averaged about an equal amount. This would bring the total material handled to approximately 86 tons an hour.

The feed to the crusher during the test was minus 5″ plus 2″. The product discharged from the 10″ Newhouse contained over 98% of material minus 1″ and only 6% of fines—⅛″ indicating very little dust.

EQUIPMENT ENGINEERS TO INDUSTRY

ALLIS·CHALMERS

MILWAUKEE WISCONSIN

AMERICAN TIGER BRAND

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AMERICAN TIGER BRAND WIRE ROPE

NO matter where you are — or what job you ask wire rope to do — you'll find that American Tiger Brand Wire Rope has a reputation for long life and dependability.

Our engineers have studied every angle of the problems you're up against and they have designed a type and size of rope for every need. Just remember that you can save money with American Tiger Brand Wire Rope.

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UNITED STATES STEEL

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Pit and Quarry Directory. (The Directory Section of the Handbook, published separately). Complete alphabetical and geographical lists of nonmetallic-mineral producing and manufacturing companies and their plants. 1936 ed., 254 pages, 8½ x 11½, paper.

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A 2-volume edition is published for greater facility in field use.

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Diesel Engines. By Lacey H. Morrison. 598 pages, 6x9; 385 ill. Describes the various forms of Diesel engines now available, explains their construction and operation, tells how to keep them running in good condition and how to install them. Actual operation costs of Diesel engines now in use in various industries are included.

The Stone Industries. By Oliver Bowles, Supervising Engineer, U. S. Bureau of Mines. Covering the building-, decorative-, and crushed-stone industries in all their ramifications. It describes rocks and covers the geology and distribution of developed deposits in every state. It embraces the qualities of stones, their uses, methods of quarrying and manufacture, and marketing.

Excavation Machinery, Methods and Costs. By A. B. McDaniel, Principal Engineer, Construction Division, U. S. Army. 530 pages 6x9; illustrated. A complete handbook on excavating in mines, pits and surface workings.

Diesel Engineering Handbook. Edited by L. H. Morrison, editor of "Diesel Power." Contains more than 800 pages devoted to the history of the development of the Diesel engine, and descriptive matter concerning the many models now on the market. Profusely illustrated.

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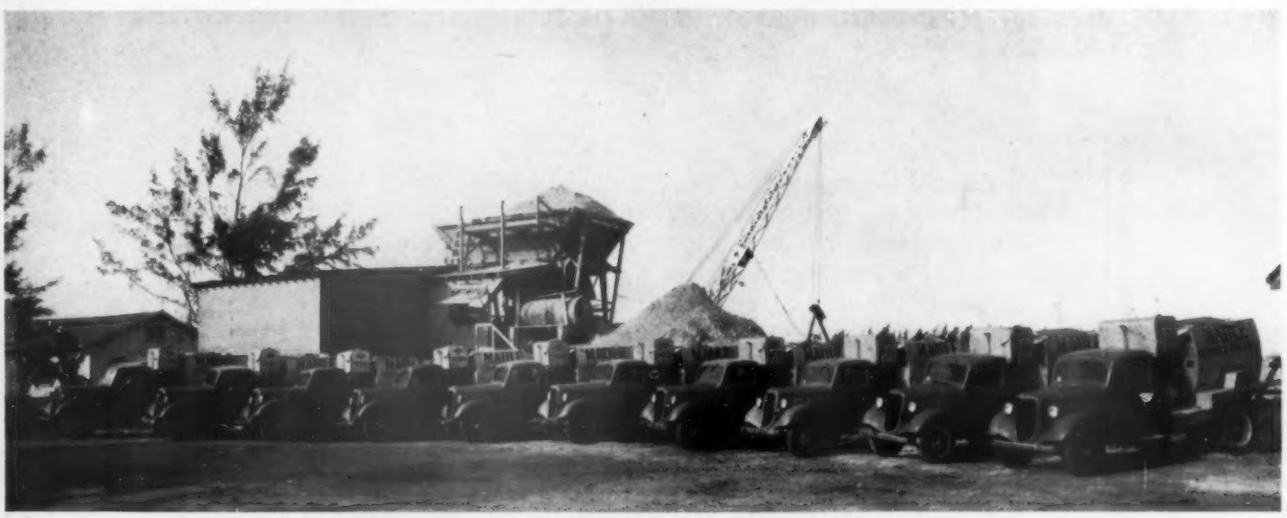
17 BLAW-KNOX TRUKMIXERS

in the Maule-Ojus Rock Co. Fleet



The *quality* concrete furnished in Miami Beach, Fla., by the Maule-Ojus Rock Company is produced and delivered by their efficient fleet of seventeen (17) Blaw-Knox TRUKMIXERS.

The original fleet of ten (10) 1½ cu. yd. units was recently augmented by seven (7) Blaw-Knox TRUKMIXER units of 2 cu. yd. capacity.

Ready mix operators everywhere like the dependable performance and the low depreciation and maintenance of Blaw-Knox TRUKMIXERS.

For future profits—investigate these remarkable truck mixers.

BLAW-KNOX COMPANY
2080 Farmer's Bank Building Pittsburgh, Pa.
Offices and Representatives in Principal Cities

ANNOUNCING

Twentieth Annual Convention
National Crushed Stone Association

Netherland Plaza Hotel • Cincinnati, Ohio

JANUARY 18, 19 and 20, 1937

In conjunction with which will be held

THE MANUFACTURERS' DIVISION EXPOSITION OF MACHINERY, EQUIPMENT, AND SUPPLIES

THE Annual Convention of the National Crushed Stone Association has, during the years since its inception, become recognized as an event of outstanding significance to crushed stone producers individually and to the industry as a whole.

It serves, as no other medium can, to develop, crystallize, and express industry opinion. It signifies solidarity of purpose and the ability of those engaged in the same line of activity to unite in the solution of common problems.

As individuals, producers will find much to reward them for a visit to Cincinnati next January: Speakers of outstanding reputation and experience will discuss problems of timely interest, both technical and legislative; opportunity will be afforded for the mutually beneficial exchange of opinions with fellow-producers, to say nothing of the pleasure to be derived from renewing old acquaintanceships; the Manufacturers' Division Exposition will command studious attention for the helpful suggestions to be obtained from an inspection of the latest developments and improvements in machinery and equipment used in the crushed stone industry.

ALL crushed stone producers of the United States and Canada, whether or not members of the National Crushed Stone Association, are cordially invited to attend our Twentieth Annual Convention. Make your plans now to be present at Cincinnati on January 18, 19 and 20, 1937.

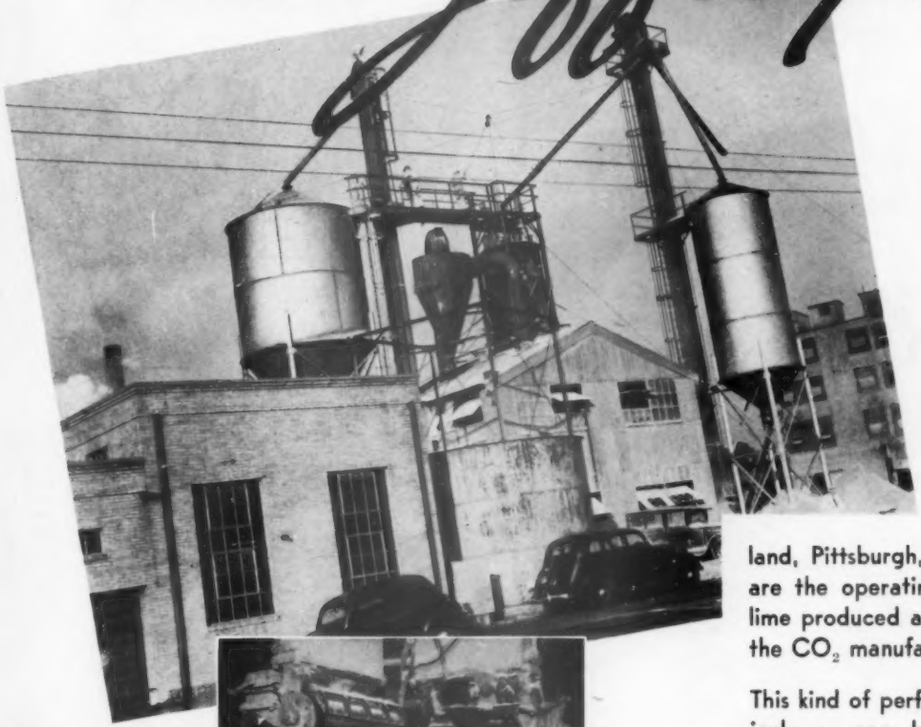
For further information write to the

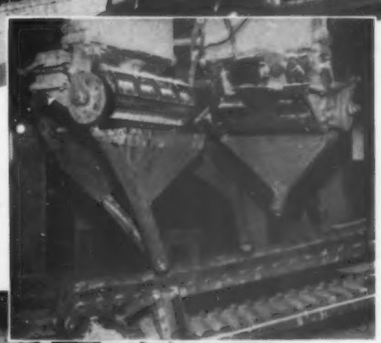
NATIONAL CRUSHED STONE ASSOCIATION

1735 Fourteenth Street N. W. . . Washington, D. C.

ANOTHER PLANT THAT DOES THINGS

SPECIFIES *Jeffrey* EQUIPMENT





(Above)—On the left the frozen carbon dioxide plant—on the right the lime and CO_2 plant, showing two Jeffrey Bucket Elevators.

The small view above shows a Jeffrey Steel Apron Conveyor which carries the lime from the kiln to storage or grinding mill. At the left is shown a Jeffrey Steel Apron Conveyor carrying stone from track hopper to a Jeffrey Bucket Elevator.

Jeffrey Steel Apron Conveyors and Bucket Elevators are playing an important role in the operation of the frozen carbon dioxide plant of the Frozen Carbonic Corporation on Neville Island, Pittsburgh, Pa. So efficient and economical are the operating methods at this plant that the lime produced as a by-product practically pays for the CO_2 manufactured.

This kind of performance . . . efficient and economical . . . can be expected of Jeffrey Material Handling Equipment wherever it is used. Jeffrey is a world-wide institution and the name stands for specialized experience in your industry. The more difficult and varied the job . . . the greater the need for proved performance of the diversified Jeffrey line.

The right units can be found among the various types of Jeffrey crushers, conveyors, elevators, chains, screens, washers, loaders and unloaders, feeders . . . to do the job to your complete liking. Jeffrey Engineers, backed by nearly 60 years of experience, will be glad to assist you to more economical material handling and reduction.

The Jeffrey Manufacturing Company

917-99 North Fourth Street, Columbus, Ohio

SALES AND SERVICE STATIONS IN PRINCIPAL CITIES

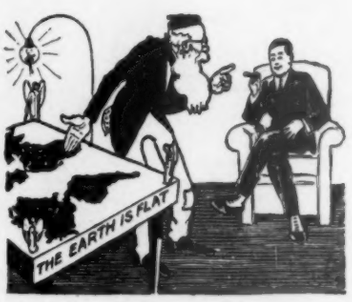
"You're All Wrong Mr. Ante-Date—All Wrong"

By Ernest V. Madison

We have all met the salesman who tells us he can quote lower prices because his firm does no advertising.

Let's ask him—**how** and **why.**

How much time does a salesman of a product not advertised to the trade, use in explaining its construction, performances and possibilities? How much time does this salesman use in making calls where the buyer will not see him because he has never heard of the product?



Isn't there a cost to a salesman's time used in obtaining an interview and making an article known? Will not this cost be repaid to the manufacturer by being tacked onto the eventual selling price?

We know that we, the users, pay for every expense of selling —along with the cost of manufacture—plus the maker's profit.

We also know that **advertising** is a quantity production method —and quantity production is economical. A single business paper advertisement introduces a product to thousands of readers as quickly as the salesman introduces an unadvertised product to one man. The shorter time required of a salesman for educational or "missionary" work, the more time he gains for actual selling. The more customers the salesman obtains for the factory the faster that factory grows and its facilities enlarge for producing at a lower cost per article.

Spring these facts on the salesman who next comes into your place of daily stipend, boasting that his firm does not advertise and therefore can quote you lower prices.

And then whisper in his ear that you believe his firm should advertise in **PIT AND QUARRY.** Let him know that you believe in the paper which gives you so much information essential to your business.

"Sure I can Handle it . . . I'VE GOT AN A-W PORTABLE CRUSHER"

Don't Be A "Wallflower" at those Lettings which are beyond the distance range of your FIXED plant

You're missing profitable business unless you own a portable crusher.

There are plenty of good jobs that can only be handled with portable equipment. It supplements your fixed plant—gives you a chance to "average out" when a contract at home goes the other way.

Austin-Western makes a full line of *portable* crushing, screening and gravel washing equipment. There is a size and model that fits your special needs.

Austin-Western No. 100

Illustrated above is the Austin-Western No. 100 Crushing and Screening plant. It is powerful and can produce as much as 200 tons of 1" material per hour, yet it is so compact it is much smaller than similar plants of like capacity. Easily transported—"sets" quickly—absolutely reliable no matter how far you take it from the nearest supply base.

From beginning to end, this plant is built for smoother, faster, cheaper operation. Has most efficient gyrating screen built; oversize parts on crusher proper; SKF self-aligning bearings. Adjustments are simply made in a minimum of time.

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Please send literature on Crushers.

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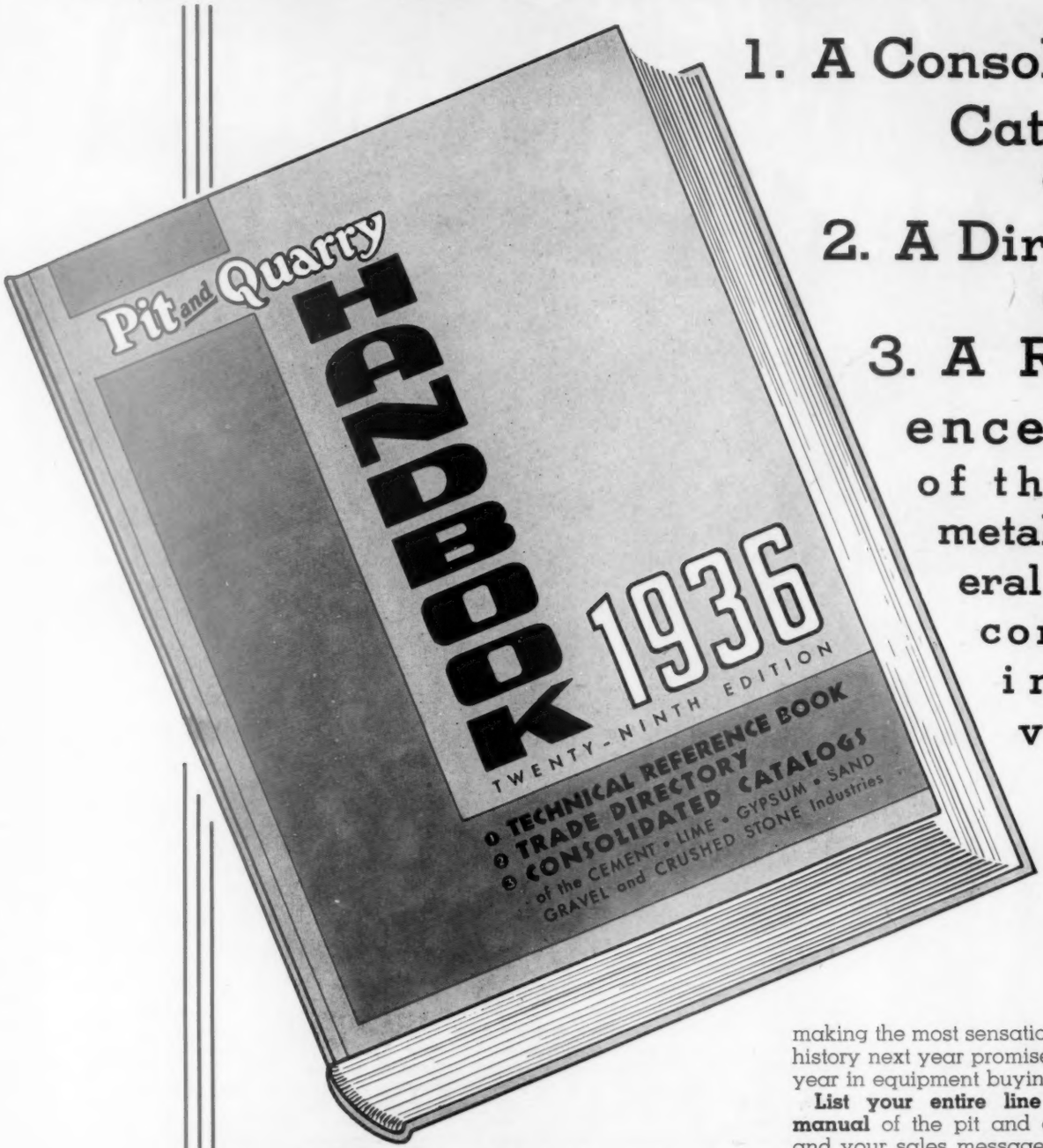

1. A Consolidated Catalog

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2. A Directory

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3. A Reference Book of the non-metallic mineral industry combined in ONE volume

THE one and only directory, reference book and combined catalog for non-metallic-mineral producers.

Build your sales campaign on a solid foundation by using **PIT AND QUARRY HANDBOOK** as the basis of your advertising. With the durable goods industries making the most sensational come-back in history next year promises to be a banner year in equipment buying.

List your entire line in this buying manual of the pit and quarry industries and your sales message will go to every prospect who authorizes or approves purchases in the 4,700 producing plants in the industry.

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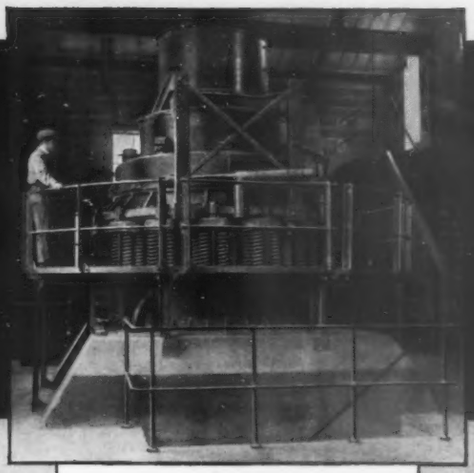

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CRUSHING and SCREENING

you can depend on SYMONS

Four-foot Short Head making a very fine limestone product.

WHETHER it is for ordinary reduction crushing or for making the finer products as are in demand today, no piece of crushing equipment is comparable to the Symons Cone. With the two types, Standard and Short Head, any requirement for product or capacity can be met. The Symons Cone is the answer for plants whose reduction crushing equipment is obsolete and no longer capable of profitably producing the sizes required today.

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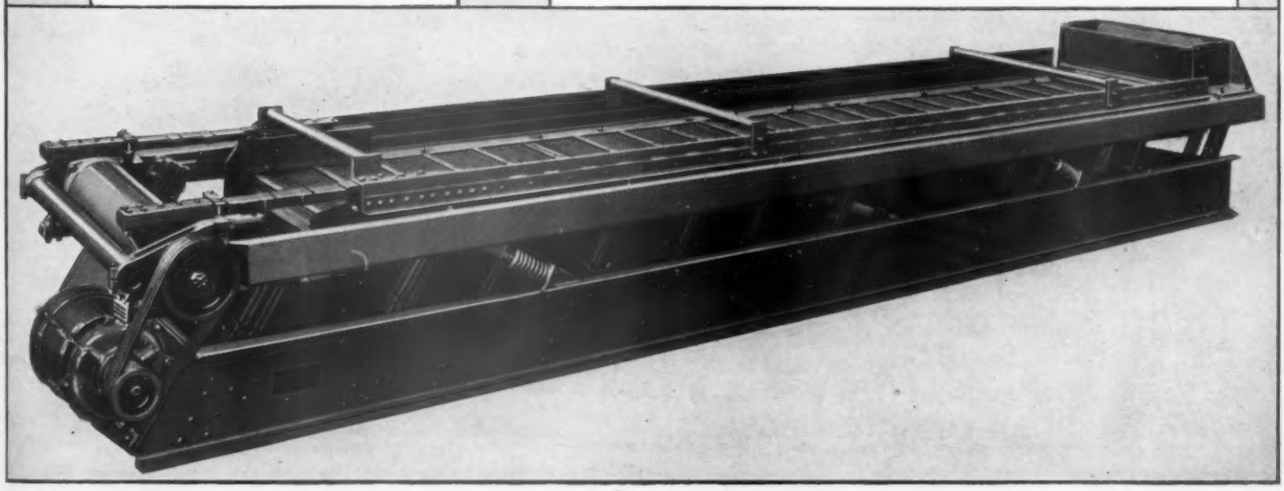

You Are Cordially Invited to Attend

the

Twenty-First Annual Convention

of the

National Sand and Gravel Association

Hotel Peabody, Memphis, Tennessee

December 7, 8, 9, and 10

1936

The program will be a practical one devoted to the practical problems of the industry. There will also be exhibition of modern machinery and equipment used in the production, distribution and consumption of sand and gravel.

All who are interested in the sand and gravel industry will be welcomed.

NATIONAL SAND AND GRAVEL ASSOCIATION

Munsey Building

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Speed PRODUCTION... *Cut* COSTS

DO YOU actually know your haulage costs? The chances are a hundred to one that they are *higher* than you think. More materials handling goes on in the average plant or mine than most executives suspect or would care to admit. It appears on the books but is disguised as wages, overhead, power and equipment.

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PIT AND QUARRY

Vol. 29 NOVEMBER, 1936 No. 5

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2 Patented pre-shrunk Supertwist Cord, far more elastic than ordinary cords, gives body greater strength, reduces flexing heat, adds thousands of miles to tire life.

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4 Extra-strong Braided Wire Beads protect against swaying loads and overloads, insure firm seating of tire on rim.

5 Chemically Toughened Rubber in both tread and body resists both tread wear and heat—protects against blow-outs.

More miles of tire life—*thousands more*—mean but one thing to truck operators—LOWER TIRE COSTS!

But you get BOTH—and more, too—in the new High Profile Goodyear for trucks.

Bigger, sturdier, tougher—you'll find this tire better in every way on the job—better in traction, in cushioning, in driving.

And it's safer. It gives you protection against both skidding and blow-outs—against carcass failure of any kind—not equalled in any other tire.

Why this amazing *plus performance?*

Because only Goodyear—in this new High Profile Truck Tire—offers you the five money-saving, *plus construction features* opposite.

Read them. See the tire. SAVE MONEY!

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THERE'S A GOODYEAR BATTERY *now!*

GOODYEAR TRUCK TIRES *money savers*

Sand Ship Sinks Off Cleveland; 19 Drown

CAPTAIN AND SIX OTHERS SAVED

Eighteen crew members and a woman passenger of the sand-and-gravel dredge and carrier *Sand Merchant,* owned by the National Sand & Material Co., Ltd., Toronto, Ont., were drowned on the night of Oct. 17 when the vessel sank in Lake Erie about 15 miles northwest of Cleveland, O. Seven members of the crew, including Capt. Graham MacLelland, were saved. The tragedy occurred during a 50-mi. gale which swept the lake, soaking the cargo with water and causing it to list. Many of those drowned had clung to life-boats for hours. Survivors were taken aboard by the *Thunder Bay Quarries,* the *Bessemer and Marquette No. 2,* which were enroute to Lake Erie ports.

Most of the crew were thrown into the lake as the 252-ft. vessel rolled over. The boat had been battling the storm for hours and its pumps were working up to the time of the disaster in an attempt to keep it afloat.

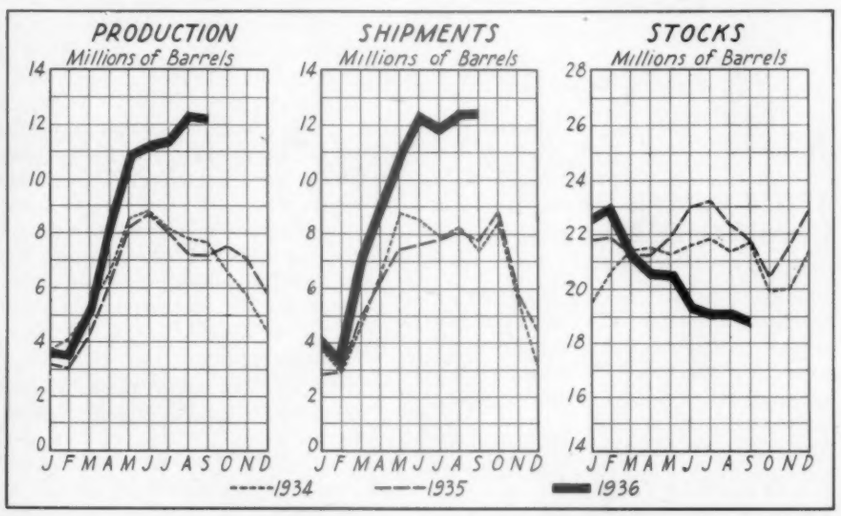
The *Sand Merchant* had taken on a cargo of about 3,000 tons of material earlier in the day at Port Pelee, Ont., for delivery in Cleveland. The storm began about 4 o'clock and the tragedy occurred about 10 o'clock. The survivors were not picked up until shortly before dawn.

Many other lake-cargo boats dropped anchor as the gale whipped treacherous Lake Erie waters into a white-capped fury. All arrived safely in Cleveland and other Lake Erie ports as the storm abated.

The *Sand Merchant* was built in 1927 and had been in constant, uneventful service until it sank. The National Sand & Material Co., Ltd., its owner, has its main offices in Toronto and operates four other sand-and-gravel boats on rivers and the lakes. These include the *Baxter Dick,* the *O'Connor Dick,* the *Charles Dick* and the *Glide.* J. F. M. Stewart is president of the company, A. M. Harnwell, secretary-treasurer, and J. D. Payne, general manager.

The *Sand Merchant* was shortly to have gone into service under charter to the Kelley Island Lime & Transport Co., Cleveland, O., transporting sand and gravel between Cleveland and Toledo, O., according to F. W. Ohlemacher of Sandusky, O., vice-president of the company.

CEMENT SHIPMENTS MAINTAIN PACE



Shipments of Portland cement in September were 12,564,000 bbl., 61.1 per cent. better than a year ago and slightly higher than in the preceding month, again establishing a new record for the year as well as the last five years. Production dropped somewhat from August to 12,292,000 bbl. but was 71.4 per cent. higher than in September, 1935. The September showing is even more encouraging when it is pointed out that the gain in sales and maintenance of output are both contra-seasonal. Stocks at the mills at the close of September were at the lowest point in many months, 18,648,000 bbl.

During September the industry utilized 57.1 per cent. of its total capacity to produce as computed by the United States Bureau of Mines. The government, however, includes considerable obsolete capacity in its figures so it is safe to assume that between 70 and 75 per cent. of the active producing equipment was used during the entire month.

The total production for the nine months ending September 30, 1936, amounts to 79,397,000 bbl., compared with 56,066,000 bbl. in the same period of 1935, and the total shipment for the nine months ending September 30, 1936, amounts to 83,700,000 bbl., compared with 55,650,000 bbl. in the same period of 1935.

Quarry Tile Firm Cited for Alleged Violation

The Federal Trade Commission has issued a complaint against the U. S. Quarry Tile Co., of Canton, O., alleging violation of the Robinson-Patman Act. It is alleged that the tile company gave 15-per cent. discounts to wholesalers who, in fact, frequently acted as retailers, thus discriminating against the tile contractors not eligible for the discount.

Sand & Gravel Assn. Executives Confer

CONSIDER NEW SCHEDULE OF DUES

New methods of fixing membership dues in the National Sand and Gravel Assn. were discussed at special meetings of the organization's executive committee and board of directors held at the Palmer House, Chicago, Oct. 13 and 14. Sliding scales, flat rates and variations of these plans were considered.

A flat rate of 2 mills per ton, with a minimum annual charge of $25 and a maximum charge of $1,800, was decided upon as most equitable to all concerned and as adequate to sustain the association on its present scale of activity. The plan will be submitted to the association's membership at the coming convention in Memphis, Dec. 8 to 10.

The following officers and directors attended:

V. P. Ahearn, exec. secy., National Sand and Gravel Assn., Washington, D.C.
Otto S. Conrades, pres., St. Louis Material & Supply Co., St. Louis, Mo.
H. S. Davison, secy.-treas., J. K. Davison & Bro., Pittsburg, Pa.
O. J. Ellington, vice-pres., H. D. Conkey & Co., Mendota, Ill.
Alex. Foster, Jr., vice-pres., Warner Co., Philaldelphia, Pa.
J. Rutledge Hill, vice-pres., Gifford-Hill & Co., Inc., Dallas, Tex.
C. S. Huntington, Link-Belt Co., Chicago, Ill.
W. H. Klein, vice-pres., Dixie Sand & Gravel Co., Chattanooga, Tenn.
M. A. Neville, vice-pres., Western Indiana Gravel Co., Lafayette, Ind.
John Prince, pres., Stewart Sand & Material Co., Kansas City, Mo.
J. M. Settle, pres., Ohio River Sand Co., Inc., Louisville, Ky.
J. L. Shiely, pres., J. L. Shiely Co., St. Paul, Minn.
H. N. Snyder, gen. mgr., Buffalo Slag Co., Buffalo, N. Y.
E. Guy Sutton, vice-pres., Neal Gravel Co., Mattoon, Ill.
Stanton Walker, director, engineering and research division, National Sand and Gravel Assn., Washington, D.C.

The guests included:

T. E. McGrath, McGrath Sand & Gravel Co., Lincoln, Ill.
Stanley A. Phillips, PIT AND QUARRY, Chicago, Ill.
Nathan C. Rockwood, *Rock Products*, Chicago, Ill.

Conducting Experiments with Bituminized Cement

The National Research Council, Ottawa, Ont., is carrying out a series of experiments in the laboratories of the Department of Public Works with bituminized Portland cement. This material, in which the cement particles are partially covered with bitumen, is being used in Europe for pavements and is claimed to possess certain advantages over ordinary cement, such as greater resistance to low temperatures. The tests made included those for strength, heat of hydration, and linear change measurements.

California Unfair Trade Practices Act Upheld

Stating that "we do not recognize the constitutional rights of any man to sell goods without profit to himself for the purpose of injuring his neighbor," the Appellate Department of the Superior Court, in Los Angeles, Cal., sustained the constitutionality of the Unfair Trade Practices Act, prohibiting the sale of merchandise below cost.

The Court said: "We have no hesitancy in holding that generically, legislation prohibiting unfair competition and preventing acts which stifle competition is well within the surveyed limits of the police power."

Blaine Smith Pays Visit to Hannibal Cement Mill

"While we are studying the question of modernization and improvements and have some plans in prospect, it is too early to make any announcement," declared Blaine S. Smith, new president of the Universal Atlas Cement Co., while visiting the plant operated by the company at Hannibal, Mo., in October.

Mr. Smith's first move in becoming president was to make a tour of the company's plants so as to familiarize himself with the production facilities as they exist.

$2,211 Paid in Gravel Royalties in One Month

During September of this year the state of Arkansas realized $2,211.55 in revenue from sand-and-gravel royalties, according to the monthly report of Revenue Commissioner Wiseman. This compares with $2,137.36 for the previous month of August.

21 Workers Killed in French Quarry Blast

According to cable reports in the press, 21 workers were killed and several injured on Oct. 22 in a quarry blast at Cavicourt, near Rouen, France.

ERRATUM

In publishing the article *The Operation of a Successful Ready-Mixed-Concrete Service* by E. B. Rayburn, Jr., in the October issue of PIT AND QUARRY, reference should have been made to the fact that the material had been presented in the form of a paper at the 1936 convention of the National Ready Mixed Concrete Assn.

Railroads Lay Plans to Raise Rates Again

ASSOCIATIONS TO OPPOSE MOVE

By arbitrary action of the railroads, the nonmetallic-minerals industry is confronted with the danger that, unless effective steps are taken, substantial increases in freight rates will be assessed beginning Jan. 1, 1937.

Following the refusal of the Interstate Commerce Commission to extend the present emergency surcharges beyond next Jan. 1, the Association of American Railroads met in continuous session in Washington for several weeks in order to arrive at a means of accomplishing indirectly the original objective of the carriers, namely, to maintain or even to exceed the level of rates authorized by the Interstate Commerce Commission in Ex Parte No. 115.

On Oct. 1, J. J. Pelley, president of the Association of American Railroads, announced in a public statement that the carriers had completed their discussions and that they would file specific proposals with the Commission for increasing the rates on the principal commodities handled by the railroads, to take effect when the emergency surcharges expired, with the carriers hoping that the tariffs incorporating such proposals would not be objected to by the affected industries.

At a meeting in Pittsburgh, Pa., on Oct. 6, the Board of Directors of the National Industrial Sand Assn. gave consideration to the adoption of a course of action which would adequately protect the interests of the industrial-sand industry and which would resist any effort by the carriers to impose upon the industry a level of rates in excess of what the traffic will bear, to the detriment of the producer and the carriers. In the case of industrial sand, the proposed increases are felt to be intolerable, unwise, and unscientific, and for that reason, in the judgment of the Board of Directors, they should meet with the united opposition of the industrial-sand industry speaking through its national organization.

New Detroit Lime Plant Has Started Producing

Operations began in October at the new plant of the Belle Isle Lime Co., at the foot of St. Jean St., Detroit, Mich. The plant, which has been under construction since spring, is said to be the largest of its kind in Michigan devoted exclusively to the commercial manufacture of lime. The construction and chemical industries will be the chief outlets for the company's product.

Road Research Work Revealed Nov. 16-18

ANNUAL MEETING IN WASHINGTON

The Sixteenth Annual Meeting of the Highway Research Board will be held in Washington, D. C., during the week of Nov. 16, according to announcement made by Roy W. Crum, director of the board. Tuesday and Wednesday, Nov. 17 and 18 will feature open meetings of departments of the board for informal discussion of current highway problems. The regular annual board meeting will be held on Thursday and Friday, Nov. 19 and 20.

Many phases of highway development and construction have been under intensive study during the past year and the reports listed for presentation are the results of widespread activities.

Owing to the realization of the important role of soil in road work a notable program has been arranged by the Soils Investigations Department: An informal open meeting all day Tuesday; A symposium on stabilized soil for roads on Friday afternoon, and several important committee reports.

Another topic of growing interest is that of roadside development. In addition to several reports at the annual meeting the Departments of Design and Maintenance will join with the Joint Committee on Roadside Development and the American Association of State Highway Officials in an open meeting on Wednesday afternoon for the informal discussion of roadside problems of mutual interest to these groups. Also on Wednesday open meetings will be held by the departments of Highway Transportation Economics, Materials and Construction.

Illinois Firm Spending $50,000 for New Plant

★ Approximately $50,000 is being spent by the Kankakee Stone Co. in opening a quarry and crushed-stone plant near Kankakee, Ill., according to G. A. Brown, president. Sizing will be done with vibrating screens and all stone is to be washed. Overburden on the deposit is being removed by dragline.

Quarry Waste Used for Porcelain-Like Products

A suggestion comes from England and Russia as to possible utilization of waste granite, diabase, and basalt for manufacture of synthetic products. In England such rocks are smelted and the molten mass run into molds where it is cast into floor tile, curbstones, and other products. It is claimed that the product made from diabase is highly resistant to acids and therefore suitable for the manufacture of chemical containers. The further claim that it has high electrical insulating properties seems strange because most diabases contain considerable quantities of ferromagnesian minerals.

A plant near Moscow, U. S. S. R., is also making similar cast products from fused diabase. Low-priced fuel would seem to be essential to the success of such projects, the U. S. Bureau of Mines observes.

Laboratory experiments conducted at Barre, Vt., show that pulverized waste granite can be used successfully in combination with china clay for the manufacture of porcelain. A flotation process for removing the undesirable mica and iron has been proposed.

Conducting Dust-Health Survey in Cement Plants

Several typical Portland-cement plants are being made the object of intensive study at present in a dust-health survey being conducted by the Portland Cement Assn. Realizing the seriousness of the occupational-disease hazard, particularly the constant danger of workmen contracting silicosis, the association has engaged Dr. Gardner, prominent specialist in dust diseases and interpreter of X-rays of the pulmonary areas, to direct the work.

Not only plant employees but controlled groups in the cement-plant community are also being subject to study in the survey. The first official report is expected to be available about Dec. 1, according to A. J. R. Curtis, asst. to the general manager.

Irwin Leaves Highway Job; Joins Rubber Firm

G. J. Irwin, formerly assistant engineer of tests, Ohio Department of Highways, has resigned to take a position with the machine and process development department of the B. F. Goodrich Co., where he will be in charge of the company's highway-products engineering. Before joining the Ohio highway department, Mr. Irwin was for seven years connected with the Portland Cement Assn. in Pittsburgh, Pa.

Maker of Steel Resumes Production of Dolomite

Operations have been resumed at the dolomite quarry and crushing plant of the Bethlehem Steel Corp. located near Salinas, Cal. The output, averaging 60 tons daily, is shipped to smelters in San Francisco and Pittsburgh, Cal.

Maine Voters Crush Diversion Proposal

FOURTH STATE TO PROTECT FUNDS

By an overwhelming vote, in some parts of the state as high as 8 to 1, the people of Maine passed a referendum bill strictly prohibiting diversion of highway funds to other uses.

Passage of this bill makes Maine the fourth state to take legal measures to protect highway funds, Missouri, Minnesota, and Colorado already having prohibited diversion of highway funds through constitutional amendments. A petition now being circulated in Massachusetts, if successful, similarly will protect that state's road money from raids.

A compilation made by the U. S. Bureau of Public Roads shows diversion of highway funds for non-highway purposes during 1935 amounting to $146,449,700; this is $24,000,000 more than during the preceding year. Diversion to general state, county, and municipal funds amounted to $86,000,000.

Dust Collectors to Be Installed in 5 Plants

★ A number of Norblo dust-collectors are shortly to be installed by the Northern Blower Co., Cleveland, O., according to M. A. Eiben, president. Included are the following:

Crushing department, New York Trap Rock Corp., Newburgh, N. Y.

Drying plant, Halton Amiesite Co., Mt. Vernon, N. Y.

Finishing mill, California Portland Cement Co., Colton, Cal.

Drying department, General Crushed Stone Co., Syracuse, N. Y.

Crushing department, Western Feldspar Co., Denver, Colo.

Heavy Demand for Cars Seen in Final Quarter

Estimates for railroad-car requirements for the fourth and final quarter of the year by the Regional Shippers' Advisory Boards indicate that 321,370 cars will be needed for the movement of sand, gravel and crushed stone compared with actual loadings of 284,469 cars in the last quarter of 1935, a gain of 13 per cent. An even greater gain is anticipated in the movement of Portland cement, the Boards having estimated loadings of 105,298 cars compared with 87,948 cars used in the last 1935 quarter, or an increase of 19.7 per cent.

Fears of an actual car shortage have been expressed by a number of producers and other industrial shippers in recent weeks.

Residential Building Reaches New Heights

OTHER CLASSES ALSO SHOW GAIN

The much needed recovery in residential building, believed by observers as necessary to support the wide gains in business generally, is here. For the first nine months of 1936 this class of construction totaled 23 per cent. more than was reported for the entire year 1935. The full year 1936 promises to reach a volume three times the size shown for either 1933 or 1934 the low-points of the depression.

In reporting on these conditions the F. W. Dodge Corp. has indicated that the volume of residential building in the 37 eastern states during the first nine months of 1936 amounted to $588,030,600 as against only $338,907,500 for the corresponding nine months of 1935, making a gain of 73 per cent. For September, 1936, alone the residential total was $80,669,800 as compared with only $41,810,800 for September, 1935, and $100,522,500 for August of this year.

Commenting on current conditions the Dodge organization observes:

"In predepression days residential building led all other classes by a wide margin. During September, there occurred for the first time since the final quarter of 1928 a residential total in excess of the total for either non-residential building or heavy civil engineering. This change in relationship represents a healthy development and within the near future the predominance of residential building may again likely become the usual relationship rather than the exceptional one."

Total construction work of all kinds started in the 37 eastern states during September amounted to $234,270,500 as against $275,281,400 for August and only $167,376,200 for September last year. (A reduction in the volume of publicly-financed construction largely accounted for the shrinkage between August and September of this year.)

For the first nine months of 1936 total construction in the 37 states amounted to $2,041,627,200, for a gain of 71 per cent. over the figure of $1,191,697,700 shown for the corresponding nine months of last year. Both public works and private work contributed to make the large gain shown between the two years in total construction.

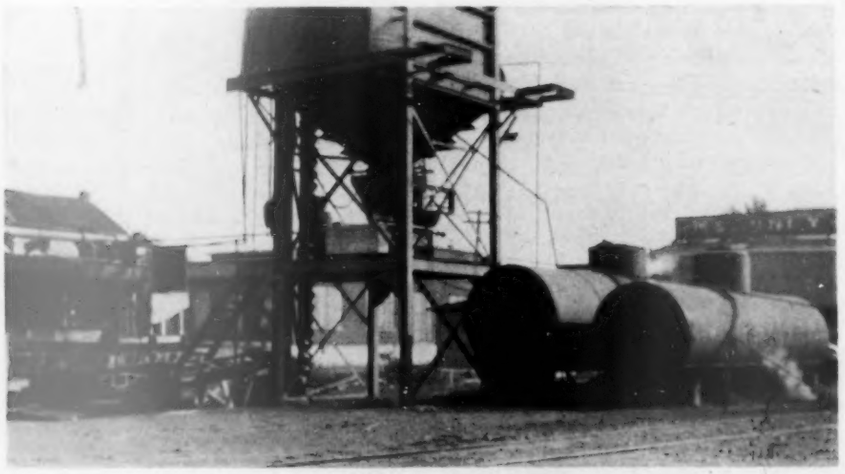
Fire Causes Damage at Gravel Plant in Denver

Considerable damage resulted recently when fire swept the plant structure of one of the sand-and-gravel operations of the J. W. Brannan Sand & Gravel Co. at Denver, Colo. The plant was owned by D. G. Gordon and leased by the Brannan firm. Inasmuch as the operation was 11 years old and of the old stationary type, it will not be rebuilt in its original form, according to F. P. Spratlen, Jr., president of the company. None of the machinery was damaged.

Erects Gravel Plant to Fill Ballast Contract

★ The G. G. Hill Co., gravel producer at Dexter, Mo., is installing machinery and equipment at a new plant near Dexter for crushing, washing and screening gravel for ballast purposes. The company recently took a contract to furnish ballast for the Cotton Belt Rwy.

★ The Universal Atlas Cement Co., Chicago, Ill., is reported to have ordered a Diesel-electric locomotive from the American Locomotive Co., New York, N. Y., for use in switching operations at its Buffington, Ind., plant.



Aggregate-bituminizing plant of National Bilt-Rock Co., Shickshinny, Pa.

Grants Consumers Co. Right to Reorganize

TWO YEARS OF LITIGATION ENDED

Federal Judge James H. Wilkerson, sitting at Chicago, Ill., on Oct. 15 signed the decree confirming the reorganization under section 77-B of the bankruptcy act of the Consumers Co., Chicago, building-material concern and important producer of crushed stone, sand and gravel. The decree ends more than two years of litigation and disputes between various factions interested in the reorganization. Voluntary reorganization proceedings originally were brought by the company in June, 1934.

The plan provides for a new corporation to take over the assets of the present concern. The new corporate title has been tentatively fixed as the Consumers Corp.

The company will be under the management of five trustees appointed by the court for four years. The trustees will serve as directors. They are George F. Harding and Martin H. Kennelly, present trustees; John J. O'Laughlin, former president; Joseph Hock, former vice-president, and William J. Lynch, a Chicago contractor not previously connected with the company.

Two Canadian Plants Undergo Improvements

★ Gypsum, Lime & Alabastine of Canada, Ltd., has announced plans for improving its plant at Caledonia, Ont., and Montreal, Que. The Caledonia improvements will entail an expenditure of about $40,000, while at Montreal $50,000 will be spent. Among the additions at Montreal will be a rock-wool department.

Aggregate-Bituminizing Plant Goes in Service

A number of crushed-stone producers have found that an excellent outlet for their product is the furnishing of bituminized aggregates for road building and maintenance.

The accompanying view shows a small all-steel plant recently placed in operation by the National Bilt-Rock Co. at Shickshinny, Pa. The plant, which was furnished by the Maltby Asphalt Equipment Co. of Buffalo, N. Y., consists of a mechanical drier, a 2-ton pug mill, the necessary elevating, weighing and batching equipment with 4-compartment steel bins overhead for dried aggregates. It has a capacity of 300 to 400 tons of finished material per day.

PCA Pushes Work on Cement-Soil Highways

EXPERIMENTS INDICATE SUCCESS

With increased attention being given to the construction of secondary roads, using stabilized mixtures of permanent or semi-permanent character, the Portland Cement Assn. has been carrying on an experimental program of cement-soil stabilization in order to share in this market, some $300,000,000 being spent annually on secondary-road improvements.

Experiments have been carried out under the direction of Frank T. Sheets, former chief of the Illinois Department of Highways and now consulting engineer and director of development of the Portland Cement Assn.

Intensive laboratory studies on cement-soil mixtures were carried on in the association's laboratory in Chicago under the supervision of M. D. Catton, who has been connected with the association's highways bureau for nearly ten years. Since most of the pioneer work in cement-soil roads was done in South Carolina, where the satisfactory results obtained attracted the attention of the association, an experimental road was built in that state. So gratifying were the results that the organization is now preparing to carry on further field demonstrations in other sections of the county in order to demonstrate the resistance of these roads to more severe climatic conditions and to stimulate greater interest in the process.

On the test road in South Carolina, about 6 per cent. of cement by weight was mixed with the soil to form the roadway. This was compacted, along with measured amounts of water with a sheep's foot roller, which tamps the mixture from the bottom up. After surface finishing a layer of bituminous mixture was placed over most of the road. This consisted of one gallon of bitumen and 50 lb. of stone chippings per sq.yd., the cost being 15 c. per sq.yd. The surfacing treatment was omitted from several portions of the road in order to observe the behavior of the cement-stabilized base under traffic. The cement-soil base cost about 40 c. per sq.yd., 17 c. covering the cost of labor and manipulation and 23 c. the cost of the cement. Thus a mile of the new type of roadway would cost about $3,000 to $5,000 and would use from 1,000 to 1,500 bbl. of cement, depending upon the width and depth of treatment.

Of exceptional interest is the fact that within 24 hr. after the cement-stabilized material was laid it had hardened to such a degree that a 20-penny nail could not be driven into the surface without bending and in taking 150 test cores, the bit of a standard core drill was worn down 1½ in.

Finished surface of a cement-soil-stabilized roadway.

Lehigh Cement Earnings Reflect New Prosperity

Report of Lehigh Portland Cement Co. for the twelve months ended September 30, 1936, shows net profit of $2,207,863 after depreciation, depletion, obsolescence and normal federal-income taxes based on the new capital set-up. The above net profit is equal after allowing for twelve months dividend requirements on 121,467 shares of 4-per cent. preferred stock to $3.47 a share on 495,628 shares of common stock. No provision has been made for federal surtaxes on undistributed profits.

This compares with net profit for the 12 months ended September 30, 1935, of $265,812, equal to $2.18 a share on the 121,467 shares of 4-per cent. preferred stock now outstanding.

New Use for Dolomite Developed in Germany

To replace magnesite for water treatment, a new filtering material, called "Magnodoppelsalz," has appeared on the market in Germany. It is made by lightly calcining dolomite quarried at Hohensyburg, Westphalia, forming a mixture of magnesium oxide and undecomposed calcium carbonate, according to the U. S. Bureau of Mines.

Forty Michigan Dealers Are Stone Firm's Guests

Forty Michigan dealers attended a luncheon at Grand Rapids, Mich., October 21, arranged by the Standard Lime & Stone Co., Baltimore, Md. Speakers included Frank C. Russell, general sales manager of the company's rock-wool division, and James Maratta, manager of advertising and sales-promotion, both of Baltimore.

Cutting in the cement with harrows continues until it is thoroughly mixed with the soil.

Water is added after mixing to supply a predetermined amount of moisture.

Sheepsfoot roller used to tamp the mixture to assure uniform compaction.

Editorial

Security for Society

SOCIAL WELFARE is not one of the fields in which America has been conspicuous either in leadership or in conformity. American legislation has lagged far behind that of European countries, and this is as true of our workmen's compensation laws, to which most of us have become accustomed, as it is of the Federal Social Security Act to whose principles too many of us react in a spirit of astonishment bordering on panic. Fundamentals that have been accepted as such in Europe for nearly a century still strike a note of novelty among us, inexperienced as we are in the study of mass-population problems and needs. As a result, the proposals for insuring social security that emerged from the recent economic depression struck many of us with cataclysmic suddenness and caught us wholly unprepared for either calm consideration or intelligent action.

This backwardness is due to causes that have little or no relation to sluggish intelligence or indifference to humanitarian considerations. It can be attributed in large part to the fact that the higher economic status of the American worker has kept him farther removed from the need for collective security aids than the wage earner of Europe. In foreign countries the serious plight of the working classes and its damaging effects on national economy were apparent to employers and statesmen almost as soon as the sense of their common interests spread among the workers themselves. The social work of Bismarck gave public expression to ideas of the paternalistic functions of the state that had been current throughout Germany for years, and even earlier, in 1850, France had adopted measures for the establishment of state insurance funds designed to afford security for workers. Similar action was taken in Italy in 1883 and in the same year Germany adopted its first compulsory accident-insurance act, which led the way for other laws covering sickness and old age. Even before that year precedents had been laid for the principle that part of the cost of such social insurance should be borne by the employer, a principle that appears novel, if not indeed revolutionary, to us.

The philosophy of individualism which has characterized the American attitude toward poor relief and other social problems was such a natural development in the American environment that its principles were extended even to the trade-union movement, which until recent years has relied more upon the effectiveness of its own power and methods for the attainment of its goals than upon government aid or intervention. Yet even in this atmosphere the need for labor legislation became recognized to such an extent that workmen's compensation laws were enacted in nearly all the states and within the last decade nearly thirty states made some provision for old-age pensions. And since the collapse of 1929 and the attendant decline in employment the movement for some form of unemployment insurance has gained headway.

Compulsory insurance plans, such as that provided by the Social Security Act, encounter all the opposition that might be expected among a people that are accustomed to voluntary action. They are not a part of the American individualistic philosophy. They imply coercion in their theory; they require coercion in their enforcement. But they recognize the fact that voluntary systems, with a few notable exceptions, have not yet succeeded in bringing within the scope of their effectiveness all the workers who need the protection which they are designed to provide, nor have they placed any of the burden on the employer who experience has shown benefits as much as the worker from the social security they have afforded.

Until within the last few years it is doubtful whether most Americans have had even a fairly accurate notion of the extent of unemployment. Its hazards have been well known, of course, since the majority of Americans have experienced them at some time in their lives, but the degree to which the national economy was affected through reduced purchasing power, the loss of productive power, and the cost of supporting those who were unemployed has only lately been realized. The cost of unemployment relief, expressing itself directly through the burden of taxation, has become apparent to us all. But the loss of productive power, except where this has been mitigated by public employment on public works, has been almost complete and certainly beyond calculation. The reduction of purchasing power has been felt most directly by those industries which have depended for their profitable operation on a sustained and widely-spread demand for their products, and they are certain to be materially affected by any scheme of social insurance, whether voluntary or compulsory and whether paid for by the workers, by the employers, by the state, or by a combination of any of these.

Direct relief through gratuitous public grants is the opposite of compulsory insurance. It is open to the serious objection that it creates in those who receive it a tendency to rely upon it by relaxing their normal efforts to obtain remunerative employment. If persisted in, it seems almost certain to create a parasitic class of dole-

takers who, although they receive the necessities of life and even perhaps a modicum of physical comfort, contribute nothing to society in the form of productive labor either of mind or body. No society can continue to exist in a state of social health while large numbers of people enjoy the benefits of socialized life without carrying any of its burdens. A large class of idle poor is more of a menace to society than a small class of idle rich. This is one of the most powerful arguments in favor of compulsory insurance.

The inability of the average worker to protect himself against the hazards of unemployment is obvious. He has no control over the regularity or continuity of his employment because the circumstances which determine them are outside his control. His earnings are dependent upon the rate at which he is paid and the time during which he is paid and both are subject to fluctuation, the one by the number of unemployed workers who compete with him for his job and the other by the ability of his employer to find a market for the products he makes. The uncertainty of his income and the certainty of his expenses—which continue usually at no lower and often at a higher level during unemployment than during employment—make it virtually impossible for him to provide reserves for unemployment, sickness and old age out of savings. Private insurance, because of its high cost, is usually beyond his reach, and its cost must be borne by the employer or the state. Without the element of compulsion neither the employer nor the employee would provide against these hazards, in the case of the employer because of a lack of interest or a desire to let the burden fall elsewhere, and in the case of the employee because of his inability to pay the costs or, where the ability exists, his lack of foresight.

The worker's family must be protected against these hazards, and society at large must be insured against them. The costs of unemployment fall not only on the worker and his dependents but on other workers, on employers, and on consumers, among whom the burdens are distributed fortuitously without regard to justice or ability to pay. The problem is, therefore, one for society and can probably be best controlled by the collective method of public social insurance. In an age when the dangers to which individuals are exposed can not be limited to them alone because of their economic interdependence one upon the other it would seem idle to contend that this problem can with impunity be ignored, or that insecurity in a large section of the population can continue without rendering the entire population unstable.

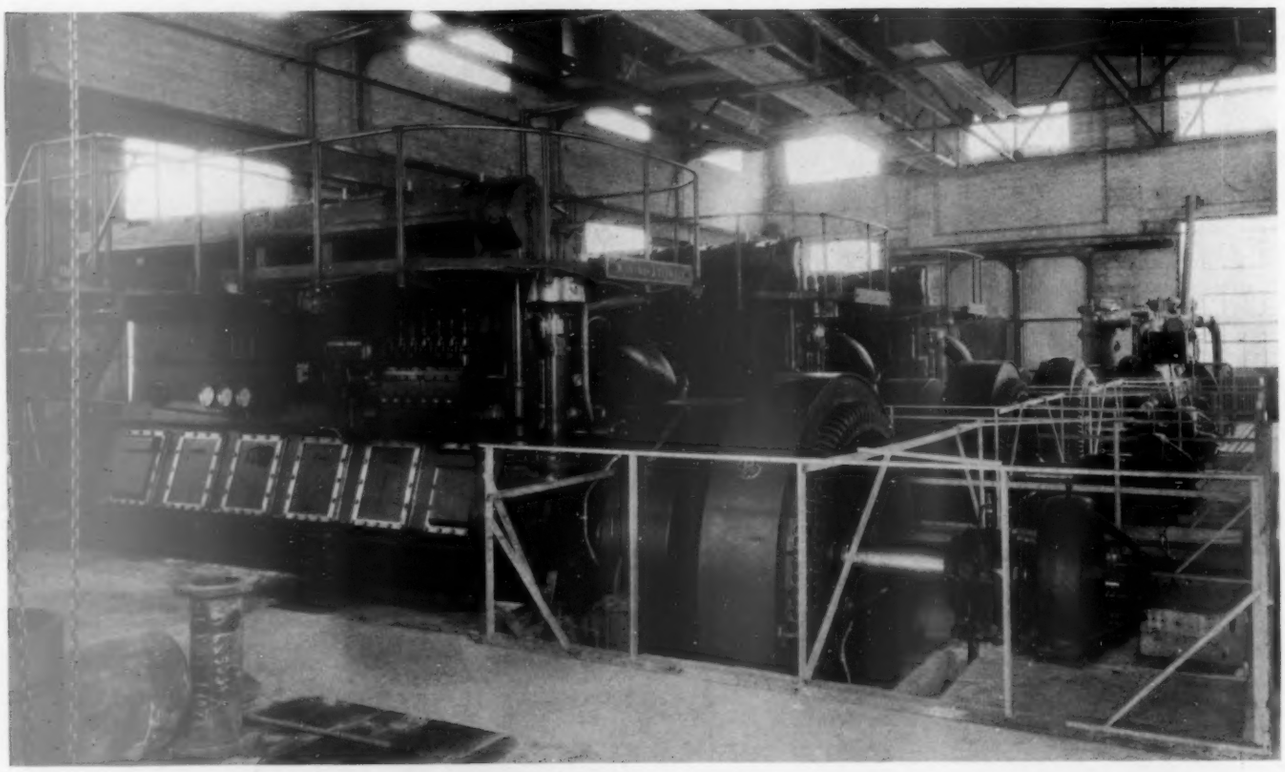
Yet strong objections have been urged against insurance protection covering the hazards of unemployment, sickness and old age. Employers contend that any plan of social insurance places too great a burden on industry, that it demoralizes workers by destroying their sense of responsibility, by discouraging their tendency to save, and by encouraging dishonesty particularly with respect to sickness and unemployment which can be feigned or deliberately fostered. Some economists claim that the cost falls ultimately on the workers themselves, that it acts as a check on the tendency of employers to increase wages and in other ways interferes with the normal working of the law of wages and the adjustment of compensation to changing economic conditions. In the opinion of the trade unions social insurance would be unnecessary if wage levels were high enough to enable workers to make individual provision for their unemployment, retirement and sickness losses. An interesting argument is that of the more radical opponents who assert that social insurance checks the revolutionary spirit of the working classes by solving one of the problems that confront them and stimulate that spirit.

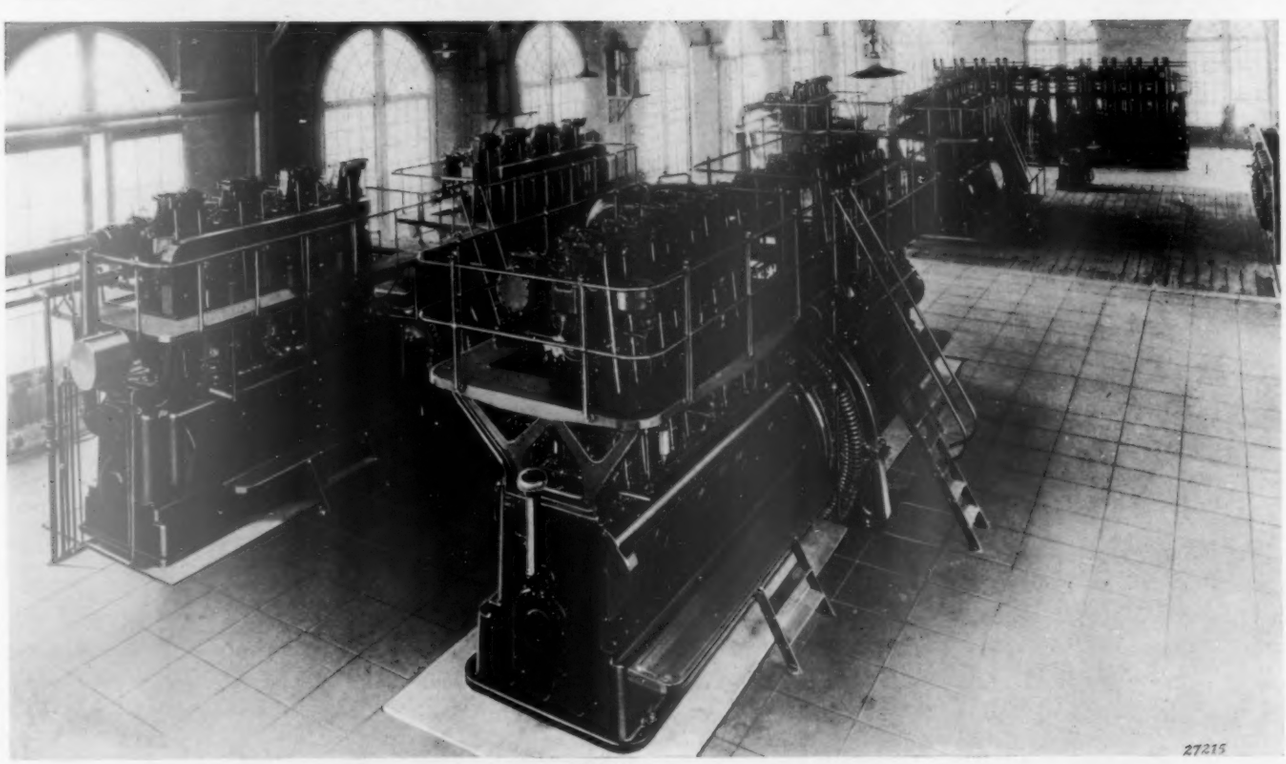
Early in the nineteenth century labor and socialist leaders advanced the theory that everyone has the right to work. This principle was later extended to include the claim to a right of maintenance. Some recognition of this right appears in the practice of some governments of meeting by money advances the deficiencies of insurance companies occasioned by excessive demands on their resources in times of continued unemployment on a large scale. These advances may be supplemented by direct relief in cases of great emergency. Between the extreme demands of socialists, who ask recognition of the right to maintenance, and the individualists, who insist that the burden be left where it was, lies the scheme of public social insurance. It seems to be well suited to present economic conditions in that it fits in with the current wage and profit systems while correcting in some measure the maladjustments of an individualistic economy. If it is properly understood as something in the nature of a compromise, designed to bridge the gaps that necessarily occur in a constantly changing economic order, and not as a complete solution of the sickness, old-age and unemployment problem, many of the objections to it will be found to be less valid than they may appear at first glance to be. Ultimately we shall undoubtedly find ways of preventing unemployment and of providing for disability due to accident, sickness and old age without resorting to insurance. These seem to be too distant to offer any satisfactory promise of relief from present difficulties.

Social security means more than security for workers. It means security for society, security for property rights, security for the profit system. It may prove to be an effective antidote for the poisonous destruction-mania of some current philosophies. None of the disadvantages that its opponents predict as inevitable consequences of its adoption rank in importance with this one aspect of its gains, while there are many other benefits that its provision insures. It is significant that in practically every important country where social-insurance systems have been established experience has justified their inauguration and they have been retained. There is no logical reason for supposing that our experience will be in any important sense different.

DIESEL POWER CUTS

TOP—The three 660-hp. engines driving generator in the Hudson River Stone Corp. plant. BOTTOM—Diesel power-house of the San Antonio Portland Cement Co. This view shows 4,000 hp. of installed power. Later installations have increased this to 7,750.





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OPERATING COST

A MARKED trend in the nonmetallic-mineral industries in recent years has been the rapidly-increasing use of the Diesel engine. Not only has the development of smaller engines of much greater horsepower per pound of weight replaced gasoline engines to some extent in mobile equipment, such as trucks, tractors, excavators and locomotives; but larger stationary units have gone into service in numerous instances. Many operators who were buyers of public-utility power, with its high demand charges and interruptions in service due to natural or other causes, have installed Diesel-electric generating units to supply electric power and have been gratified at the low cost of such service. Smaller plants have changed to Diesel engines for direct operation of their plant equipment, either in whole or in part. In some instances a single machine has been utilized to drive all the equipment. In other plants two or more Diesel engines have been located so as to drive the various processing units. Portable-plant operators, too, have found the Diesel engine admirably suited to drive their equipment at surprisingly low cost. Dredges, tubgoats and other floating equipment are also among the important users of Diesel engines and where these operators have kept cost records the use of such equipment has more than justified its adoption. Power costs have been cut 50, 60 and even 75 per cent. in many cases.

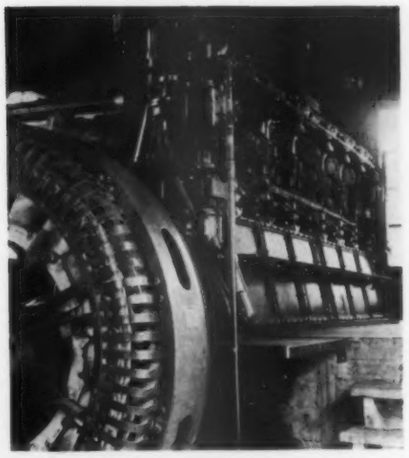
From figures kept by PIT AND QUARRY's field editor on plants he has visited throughout the country and from conservative estimates of others, it is estimated that about 1,800 Diesel or semi-Diesel engines are now in service in the 5,900 plants in this field. Most of these range from 120 hp. to 360 hp. in size, with a few up to 750 hp. and an increasing number of less than 120 hp. It is estimated that from 300 to 350 Diesel engines are being installed annually to replace other prime movers and for installation in new operations.

Power Generation.—Diesel engines driving electric generators to fill power requirements are used in a number of plants in the pit-and-quarry field. With this equipment power is generated at a cost as low as ½ c. per kw.-hr. Probably the most recent installation on record is that in the Krause, Ill., crushed-stone plant of the Columbia Quarry Co. Here the abandonment of an electric-traction line supplying the plant with a.-c. current at 25 cycles brought up the problem of either rewinding all motors for 60-cycle current and buying power from a public-utility company at a higher rate than it had been paying, or generating power at the plant. The latter alternative was chosen and the company installed two National-Superior Diesel engines and Allis-Chalmers generating equipment. One unit is an 8-cyl. model of 525-hp. rating; the other is a 6-cyl., 400-hp. machine. Although only in operation for a few weeks, the company expects its power cost will not exceed 8 mills per kw.-hr. as compared to 2.6 c. had power been purchased.

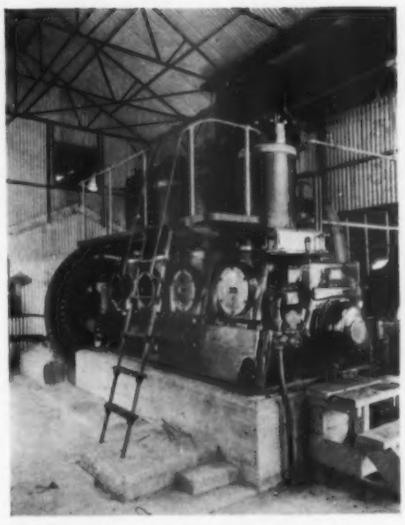
Said to be the largest in existence producing commercial crushed-stone and ballast, the Hudson River Stone Corp. plant near Cold Spring, N. Y., also has one of the largest Diesel-engine installations. Three 6-cyl. McIntosh & Seymour 4-cycle solid-injection engines, each rated at 660-hp. at 300 r.p.m., drive generators with a total output of 500 kw. in the power-house. The decision to use Diesels followed an extensive investigation by the company of costs as compared with those of purchased power. It was found that operating only 8 hr. daily the cost would be lower by plant generation, while for operating at longer periods the cost per kw.-hr. would be still lower. Two 165-hp. Chicago Pneumatic Diesels are also used at this plant to drive two 1,200-cu. ft. capacity air-compressors.

In the central power-house of Best Bros. Keene's Cement Co. at Medicine Lodge, Kan., two McIntosh & Seymour 675-hp. engines are direct-connected to General Electric 400-v., a.-c. generators. Not only does this supply power for the entire Best Bros. operation but the equipment is tied into the lines of a local utility company and in emergencies is synchronized with its current to furnish electricity to communities within a 30-mi. radius of the plant.

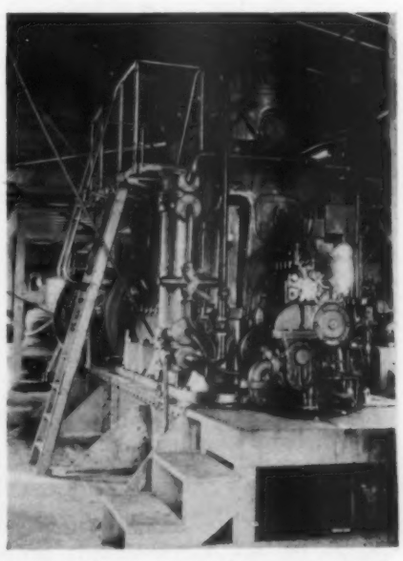
Power for driving the motors in the plant and quarry of the Consolidated Feldspar Corp. at Keystone, S. D., is supplied by a 6-cyl. 440-hp. Busch-Sulzer marine-type Diesel engine driving a 375-kv.-a. Westinghouse alternator. The 38-40 gravity distillate used as fuel is stored in a 12,000-gal. tank.



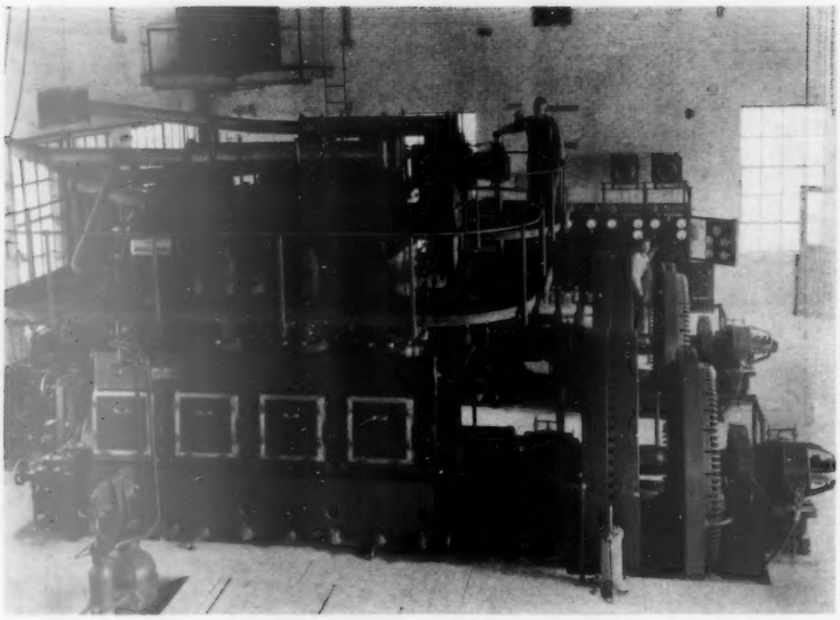
This 440-hp., 375-kv.-a installation provides power at Keystone, S. D., for the Consolidated Feldspar Corp.



One of the two Diesel-engine dredge installations of the Weston Sand & Gravel Co.



The 240-hp. engine driving generator at plant of the Highland Sand & Gravel Co.



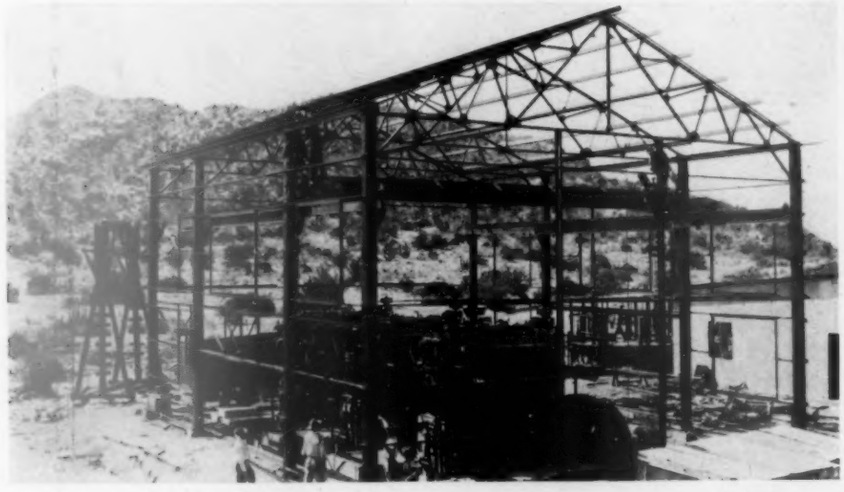
Two engines each of 675 hp. driving alternators in the power-house of Best Bros. Keene's Cement Co.

The 440-v. current used in the crushed-stone operations of Heumader Quarries, Inc., near St. Joseph, Mo., is generated by a 125-kv.-a. Fairbanks-Morse alternator driven by a direct-connected 150-hp. 3-cyl. Type Y Diesel engine of the same make.

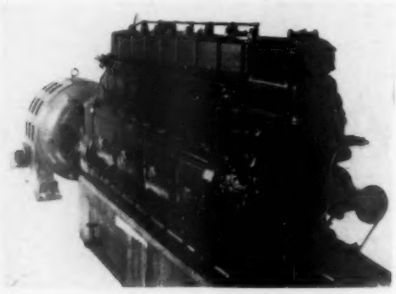
A total of 935 Diesel hp. is installed to provide all the power used in the rock-asphalt quarry and crushing plant of White's Uvalde Mines, in Uvalde County, Tex. Two Ingersoll-Rand 330-hp. solid-injection 3-cyl. engines drive 220-kw. generators to supply power, an Ingersoll-Rand 55-hp. connected to a 35-kw. generator supplies current for lights, while a number of smaller Diesels are used for direct driving of remote pieces of equipment. Installed over ten years ago, all these engines were still operating satisfactorily a short while ago and repairs and up-keep are said to have been nearly negligible.

The aggregates plant of the Sheridan Sand & Gravel Co. near Sheridan, Ill., is electrically-driven, power being generated at the plant by a Fairbanks-Morse 220-hp. 3-cyl. Diesel engine which drives a 125-kw. generator. A second Diesel engine, also supplied by Fairbanks Morse & Co., is a 2-cyl., 100-hp. unit which drives a Crocker-Wheeler 75-kw. generator. Both installations transmit power through 12-strand Flex-Mor V-belts.

Although plant-generated Diesel power is so often chosen even when purchased power is available, one of Mexico's newest cement plants, far from utility power lines, was necessarily forced to create its own. Naturally it turned to Diesel engines to drive its generating equipment. Cemento Portland Nacional, S. A., near Hermosillo has three Worthington Diesels, each of 360-hp. driving 312-kv.-a. Westinghouse



Diesel engines being installed in the cement plant of Cemento Portland Nacional, S.A.

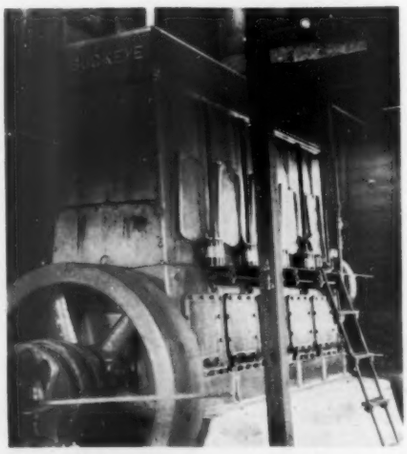


Diesel-generator equipment in the plant of the Southwest Sand & Gravel Co.

2,300-v. generators. Two of these units can fill all the normal power requirements, the third being for stand-by service and is brought into use for short periods only when the huge 300-hp. mill motors are started.

In order to operate the slurry agitators in case of power failure, the Port Colborne, Ont., wet-process plant of Canada Cement Co., Ltd., has installed a 125-kv.-a. auxiliary generator driven by a 120-hp. Vickers-Petter Diesel engine.

Another Canadian producer, the Maissonneuve Quarry Co. of Montreal,



The new 187½-hp. engine which recently replaced electric power on the dredge of the Tecumseh Gravel Co.

obtains power for its crushed-stone and aggregate-bituminizing plants with Diesel-driven equipment. A Fairbanks-Morse 3-cyl. 180-hp. engine drives a General Electric alternator, producing current at 550 volts.

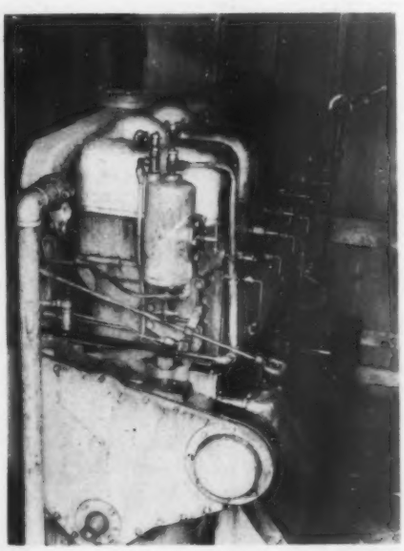
A 110-hp. Atlas-Imperial Diesel engine drives the generator which supplies power at the sand-and-gravel plant operated at Reno, Nev., by Frank B. Marks.

Fairbanks-Morse Diesel engines connected to generating equipment provide power at a number of other plants. These include the Clay Spur, Wyo., operations of the Silica Products Co. of

Automatic clutches are thrown in when this 560-hp. engine starts at the Sunbeam Quarries Co. operations.

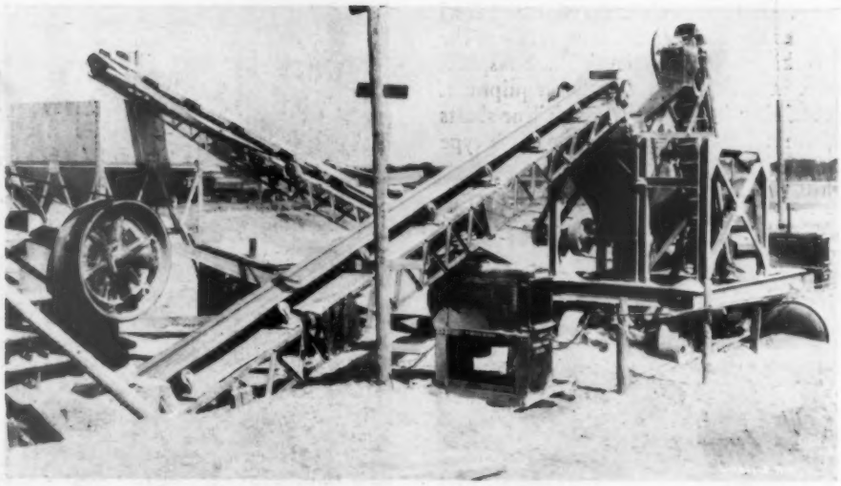
Kansas City (420 hp.); the crushed-stone and premixed-concrete plants of the Francey Stone & Supply Co. near Milwaukee, Wis. (400 hp.); the West Roxbury, Mass., sand-and-gravel plant of the Highland Sand & Gravel Co. (240 hp.); and the Southwest Sand & Gravel Co. plant near Harrison, Ark. (120 hp.).

Direct-Drive Applications.—In smaller plants, where line-shafting, belts and



One of the two Diesel engines of the Southern Rock Asphalt Co.

couplings are inexpensive as compared to electric generators and individual motor drives, Diesel engines are often



Two 40-hp. units supply power to the portable gravel plant of W. C. Burns, Idaho Falls, Ida.

used for direct or semi-direct drive. Sometimes it is also advisable to use one or more Diesels to drive the larger, individual machines. Here, too, the economy of the Diesel engine plus the reliability of its performance has resulted in a large number of applications in the pit-and-quarry industries.

An excellent example is found in the mining and milling operations of Skagit Talc, Inc., near Sedro-Wooley, Wash. An Atlas Imperial 6-cyl., 135-hp. Diesel engine drives line-shafting through Texrope to operate air-compressors, saws, two small generators and other equipment.

Two Fairbanks-Morse Diesels are used for direct-power application at the crushed-stone workings of C. C. Beam, Inc., at Melvin, O. One of these, a 100-hp. 2-cyl. engine, drives a Symons cone crusher; the other, a 4-cyl. 200-hp. unit, provides power to operate the McCully 30-in. gyratory crusher.

In the blast-sand plant of the Anderson Sand & Gravel Co., Saginaw, Mich., a 50-hp. McCormick-Deering Diesel engine drives all the equipment through line shafting and belts.

The quarry and crushing plant of the Sunbeam Quarries Co. near Clermont, Ky., has a capacity of 30 car-loads of material daily. A single 560-hp. Fairbanks-Morse Diesel engine provides all the power. Clutches on the various machines are thrown in automatically when the engine turns the main driveshaft up to its required speed.

Formerly an all-electric operation, the Southern Rock Asphalt Co., Dougherty, Okla., recently installed a 125-hp. Atlas Imperial air-injection Diesel engine to drive the main conveyor and secondary hammer-mill, while a 150-hp. Atlas Imperial engine of the same type drives the primary hammer-mill.

Two lime-rock plants operated by Connell & Shultz near Williston, Fla., are each driven through shafting and belts by 80-hp. Fairbanks-Morse Diesel engines.

More than six years of trouble-free operation is claimed for the Primm 75-hp. low-compression semi-Diesel engine which drives the equipment in the crushed-stone plant of the Rockport Stone Co. near Bluffton, O. Power is transmitted through line shafts.

Portable gravel plant near Midland, Mich., and the Diesel unit which provides all the power.

A 100-hp. Fairbanks-Morse Diesel drives the Sullivan air-compressor at the workings of the Reliance Rock Asphalt Co. at Ellis, Mo., all other equipment obtaining its power through line-shafts from a 120-hp. Diesel of the same type and make.

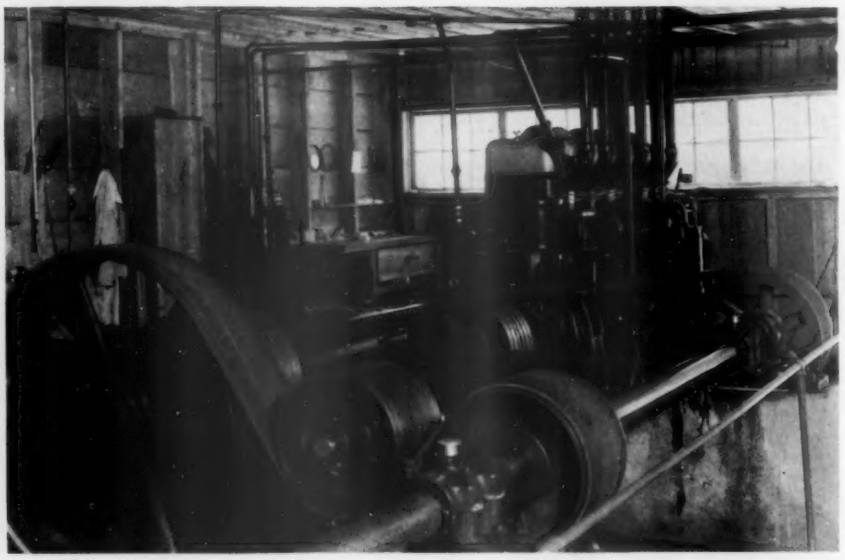
A Venn-Severin 300-hp. 4-cyl. semi-Diesel engine supplies the power to operate most of the equipment at the quarry and crushed-stone operations of the Dietz Hill Development Co. near Kansas City, Mo. A system of belts, line-shafting and chain drives is employed.

The 300-hp. engine at the Dietz Hill Development Co. operations.

Two Fairbanks-Morse 2-cyl. Diesels are used at the gravel plant of W. R. Bonsal, Inc., Lilesville, N. C., and a similar engine is in service at the gravel plant operated near Dorothy, Tex., by H. T. Farrell.

Power for the hoisting equipment and crusher at the Haile, Fla., lime-rock plant of the Ocala Lime Rock Corp., is supplied by a Bessemer semi-Diesel engine of the horizontal type.

McCormick-Deering Diesel engines have been used in a number of small crushing plants in the west where crushed rock was supplied for highway construction. One or more of the PD-40 Diesel units are usually employed to operate these plants, which are portable or semi-portable in character. Operators of some of these plants are W. C. Burns, Idaho Falls, Ida., Saxton & Looney, Corvallis, Ore., and the highway department of the State of Washington.



Mining and milling operations of Skagit Talc, Inc., are powered by this 6-cyl., 135-hp. engine.

At the Levan, Utah, plant of the Pyramid Gypsum Plaster Co., a 125-hp. Caterpillar Diesel engine has gone into service to drive the equipment in the crushing, grinding, calcining and packing departments. The Diesel replaced a steam-engine and the fuel cost of the newer equipment is about the same as the wage paid the fireman who took care of the boiler on the old steam-driven equipment.

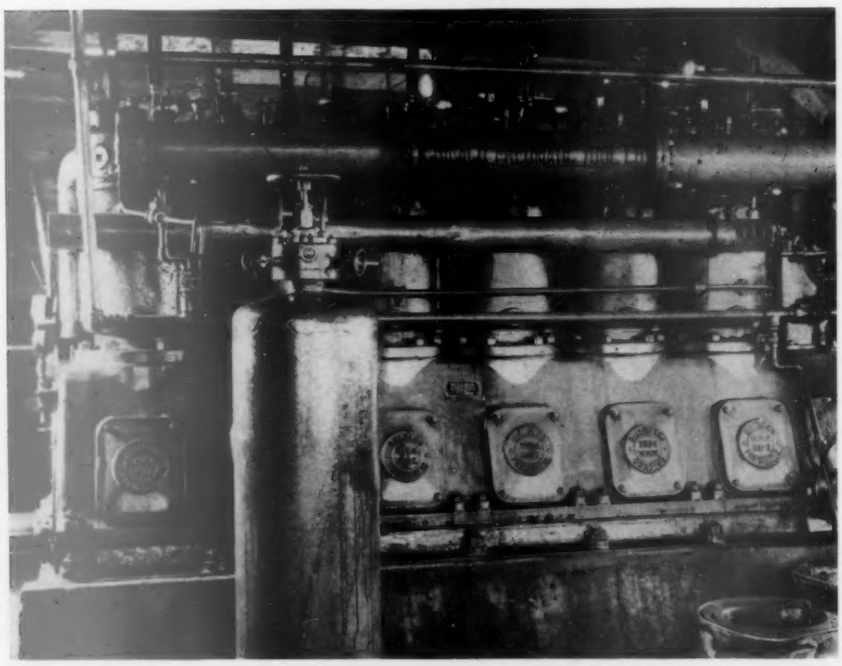
A 125-hp. Buckeye Diesel engine operates the entire crushed-stone plant of the Union Quarries Co., Van Wert, O., with the exception of the air-compressor, which is separately driven by a 20-hp. Fairbanks-Morse Diesel engine.

Through a system of belt drives, the equipment at the operations of the Florida Trap Rock Product Co. at Zephyrhills, Fla., is powered by an 80-hp. Diesel engine.

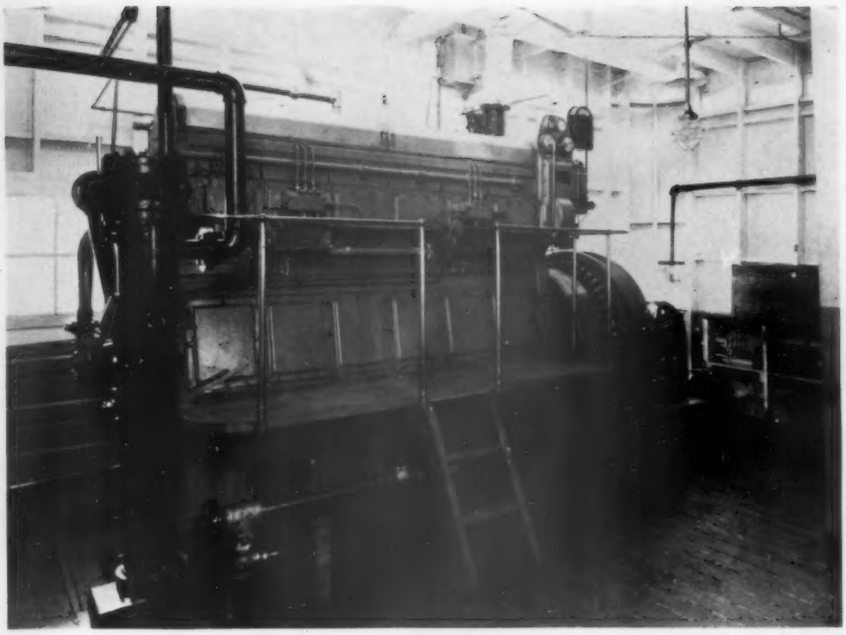
Two small crushing plants operated near Knoxville, Tenn., by the Knoxville Crushed Stone Co. are each driven by 35-hp. Diesel engines.

The new Super-Straightline portable crushing and screening plant recently introduced by the Iowa Mfg. Co. is shown in an accompanying view in operation near Midland, Mich. The plant is powered in its entirety by a Caterpillar Diesel unit.

Floating Equipment.—Because of their heavy power requirements, dredges and towboats have provided good opportunities for the Diesel engine. There are a great many installa-



Output was doubled after this 240-hp. engine went into service on the dredge of the Anderson Sand & Gravel Co.



The 6-cyl. 325-hp. Diesel engine and alternator which operate all the equipment on the new dredge of the Kanawha Sand Co.

tions in this field and only a few typical ones will be noted here.

One of the largest hydraulic dredges in operation in the sand-and-gravel industry is in service on the Meramec River, operating out of Jedburg, Mo. It is owned by the Missouri Portland Cement Co. and has a capacity of 500 tons per hr. The 22-in. dredge pump is driven by an 840-hp. Fairbanks-Morse 6-cyl. Diesel engine. An automatic bell system sounds an alarm if the water or oil runs low.

The twin-screw river tug *William Dickinson* which the Marquette Cement Mfg. Co. uses to tow barges to and from its distributing plants along the Mississippi River is powered by two 6-cyl. 350-hp. solid-injection, directly-reversible Diesel engines made by the Atlas-Imperial Diesel Engine Co. of Oakland, Cal.

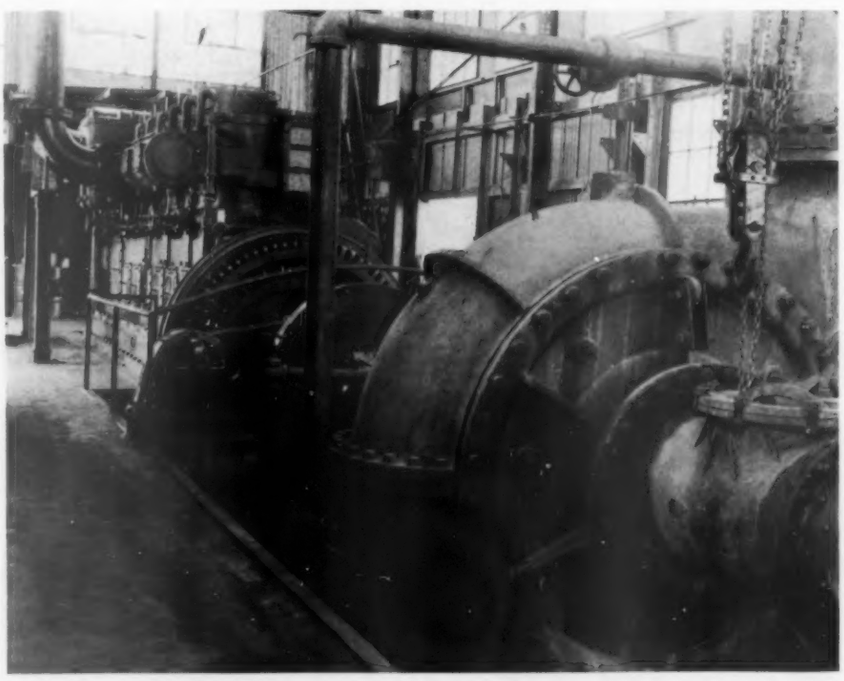
Two 240-hp. Busch-Sulzer Diesel engines drive the all-steel, all-welded cargo carrier *Dolomite No. 1,* operated on the New York Barge Canal by the Dolomite Products Co.

Six Diesel-driven tugboats with a combined rating of 1,610 hp. tow barges of sand and gravel from two Long Island plants of the Goodwin-Gallagher Sand & Gravel Co. to the New York City waterfront. Fairbanks-Morse marine Diesels are used exclusively. Cost records on operation kept on one of the tugs, the 360-hp. Diesel-driven *Catherine Pope* show a yearly total of $1,930 compared with $8,281 for the 280-hp. steam-driven *Phoenix*. And the *Catherine Pope* did more work. Loading Diesel fuel requires only an hour's time once every week or two while with steam-driven vessels many hours were taken up loading coal into the bunkers almost daily.

A dredge operated by the Anderson Sand & Gravel Co., near Juniata, Mich., employs a 240-hp. Chicago Pneumatic Benz-type Diesel engine to operate the cutting-and-screening ladder as well as other equipment on board. After its installation, along with other improved machinery, it was found that the output had been increased from 45 to 100 cu.yd. per hr.

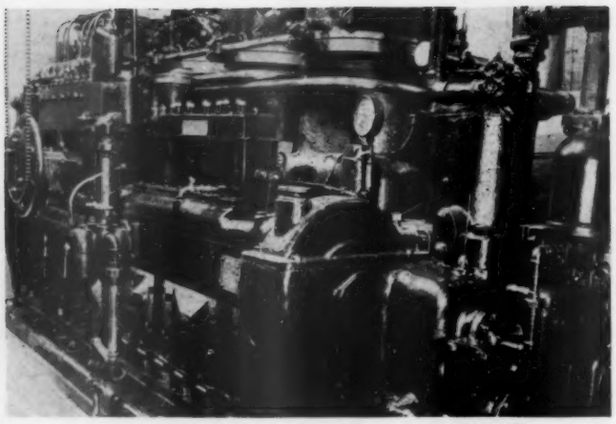
When the new dredge of the Kanawha Sand Co., Parkersburg, W. Va., went into service this year its Diesel-electric power-plant proved to be all that was expected in the way of flexibility of operation with ample power at low cost. Its 6-cyl., 325-hp. Cooper-Bessemer Diesel engine drives a Westinghouse 250-kv.-a. alternator which supplies current to all the motors on the dredge. The company had been an important user of Diesel engines previously, a small ladder dredge and two tow-boats having been powered with Diesels. Extremely low operating costs on the older equipment had made the company "Diesel-minded" when the new dredge was planned.

Power costs dropped sharply after this 125-hp. unit went into service for the Pyramid Gypsum Plaster Co.



The 840-hp. engine driving the 22-in. pump on the dredge owned by the Missouri Portland Cement Co.

The "Colonial"—one of the busy Goodwin-Gallagher tugboats.



The 6-cyl. Diesel engine in the "Colonial."

The Amsco dredge pump on the Carolina Sand & Gravel Co. hydraulic dredge at Kathwood, S. C., is belt-driven by a 6-cyl. 130-hp. Caterpillar Diesel engine, while a 65-hp. 3-cyl. Caterpillar Diesel drives a generator on the floating plant to supply current for the hoist and other motors aboard and the screening equipment on shore.

Two dredges operated by the Weston Sand & Gravel Co. near Logtown, Miss., are both Diesel-powered. The larger utilizes a 240-hp. 4-cyl. Worthington engine. The smaller dredge gets its power direct from a 150-hp. Fairbanks-Morse unit.

A Fairbanks-Morse marine-type Diesel of 140-hp. operates the 10-in. Amsco pump on the dredge owned by the Standard Gravel Co., Inc., Antoine, Ark., which raises its material from the bed of the Ouachita River. Other equipment also gets its power from the Diesel engine through line-shafting.

Thirty steel barges carry sand and gravel dredged from the Delaware River to the Philadelphia distributing yard of the Liberty Corp. Two tugs, each powered by a 100-hp. Diesel engine made by the Wolverine Motor Works, Bridgeport, Conn., are used to transport the barges.

When the Independent Sand & Gravel Co. of Wichita, Kan., took a municipal contract for making a fill hydraulically, it chose a 200-hp. Atlas Imperial Diesel engine and an 8-in. Amsco pump to do the job at a profit. The operation was on an average head of 190 ft. pumping through 2,500 ft. of 8-in. pipe. According to the Wichita representative of the Atlas Imperial Diesel Engine Co., the equipment handled in the neighborhood of 50 cu.yd. of material per hr., depositing 75,000 cu.yd. to make the fill. The fuel and lubrication cost was exceedingly low for such an operation, totalling but $736.82.

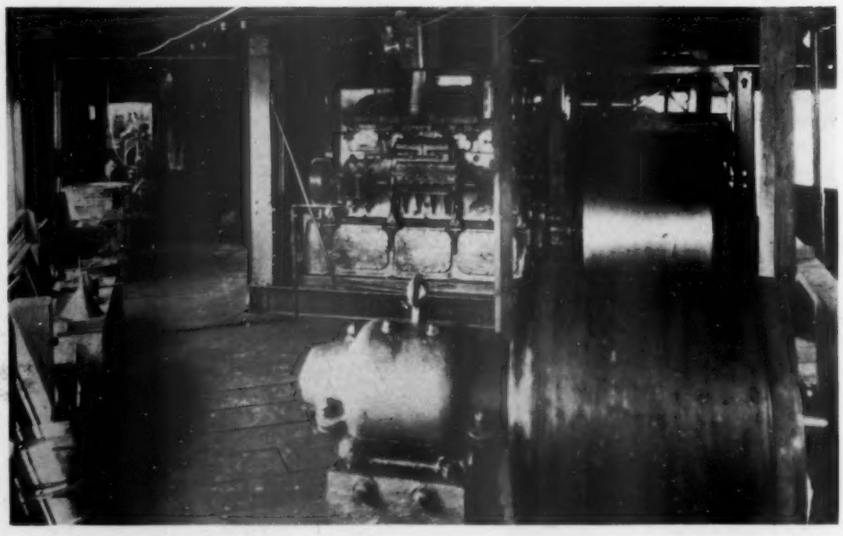
"This job caused quite a lot of comment by everyone who saw it as this [2,500 ft.] is considered a long distance to pump sand without the aid of a booster pump," according to the Atlas Imperial Co. "No difficulties were experienced. No shutdown or other expense was charged to any of the equipment during the job. The pump was kept turning in the neighborhood of 780 to 800 r.p.m. continuously in order to obtain the desired results."

The Tecumseh Gravel Co., Tecumseh, Mich., has had many years of experience with both electric power and internal-combustion engines. Recently it replaced electric power on its dredge with a Diesel engine. This is a 5-cyl. Buckeye unit developing 187½-hp.

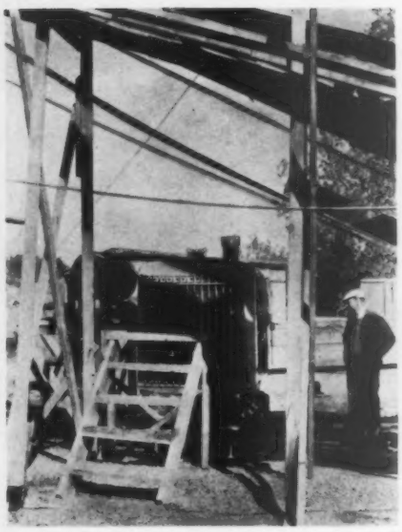
A tugboat which tows gravel barges for the Denton Sand & Gravel Co., Pacific, Mo., is driven by a 75-hp. Fairbanks-Morse Diesel engine. Another small engine, an 85-hp. Bessemer Diesel, drives a generator on the dredge of the Florida Gravel Co., at Chattahoochee, Fla., to supply electric current. The 10-in. Amsco dredge pump, however, is direct-driven by a 170-hp. Bessemer Diesel engine.

When the Julius Keg Co., McHenry, Ill., installed a Buda Diesel engine on its dredge to replace steam power, it found that its production cost per cu.yd. was less than 2 c. Formerly it was more than 6 c.

One of the two Diesel engines on the Carolina Sand & Gravel Co. dredge.



Diesel engine and belt drives on the dredge of the Julius Keg Co. Production costs were cut two-thirds after this installation replaced steam power.

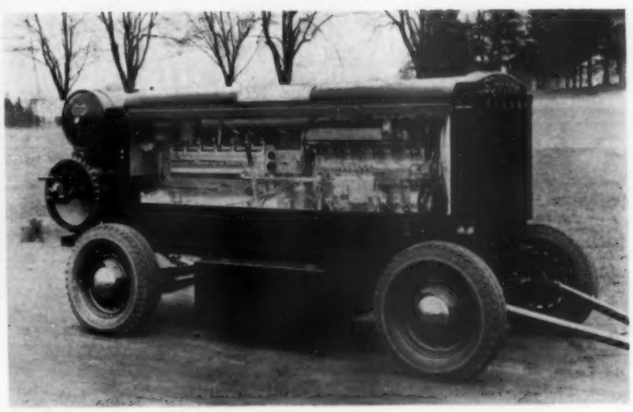


This Buda Diesel engine drives the crushing plant of H. C. Rogers & Son, Yakima, Wash.

A Fairbanks-Morse Diesel supplies the power for driving this Model 765 P & H Pacemaker shovel. Diesel engines are now standard equipment on all Harnischfeger Corp. shovels.

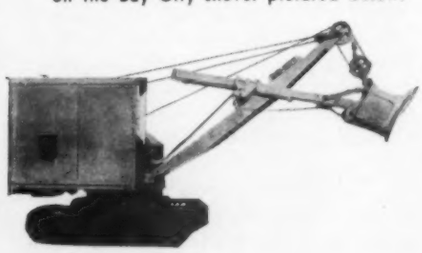
Fuel cost on this Sterling-Cummins Diesel truck has averaged only $1.18 per 200-mi. trip. It is one of a fleet of ten operated by the Southwestern Portland Cement Co., Victorville, Cal.

Below—Compressor driven by a Buda Diesel engine. The Buda Co. also supplies Diesels for stationary power service and for driving mobile equipment such as excavators, locomotives, etc.



Five shovels and 11 tractors, all driven by Caterpillar Diesels are being used on the Mohawk Dam project in Ohio. The view at the left shows some of the equipment at work.

A 47-hp. Hercules Diesel is optional power on the Bay City shovel pictured below.



Trunk-line belt-conveyor No. 6 at its crossing with highway under construction.

New Raw-Gypsum Operation in Nova Scotia Will Serve Both American and European Markets

By R. A. McMULLIN

GYPSUM in the form of natural rock, when dehydrated, becomes a quick-setting material, known for years as "plaster of Paris." While this calcined gypsum has long been used by surgeons, dentists and artists, and in a variety of industrial processes, the growth of the gypsum industry has been due to its increased use as a structural, fire-proofing and sound-insulating material in the construction industry in the form of wall-board, wall plaster, gypsum block, and as a retarder in Portland cement. The ever-increasing demand has made it necessary to search for this material over all North America.

Although nature has provided enough free gypsum to supply the needs of every building in America, this quantity deposit is spread like enormous sand dunes over 176,000 acres in the San Andres Mountains section of New Mexico, commonly known as the "white sands of Alamogordo." It is so far from the principal market demands that transportation expense has made it useless for any purpose other than a rare National Park.

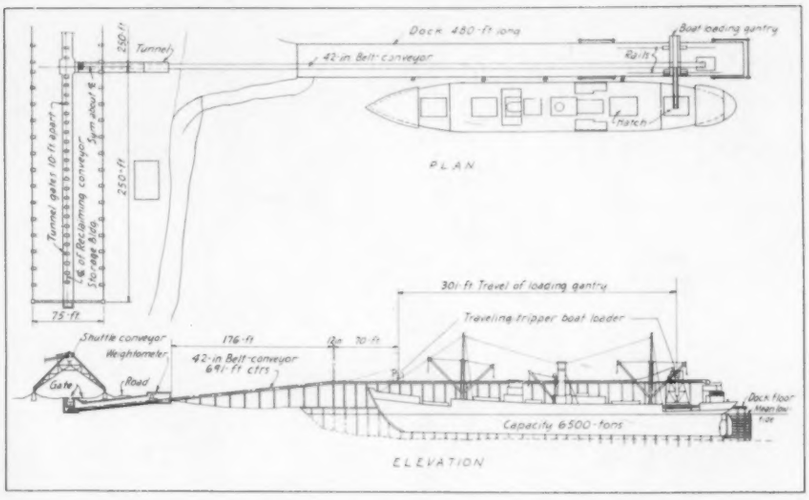
Turning one's back on this deposit and traveling over the eastern half of the United States, one finds few deposits of gypsum of any real consequence or in any easily workable quantity convenient to the large Atlantic seaboard markets until one reaches the shores of the Atlantic Ocean itself, and then not until one reaches the neighboring Canadian maritime provinces of New Brunswick, Nova Scotia and, particularly, the far eastern island of Cape Breton. Here gypsum abounds in quantity and quality, and the friendly attitude of the Canadian Government to enterprises of this kind has opened the way for gypsum production. While a vast quantity of gypsum has already been taken out of Nova Scotia, it has been done under various handicaps of quarrying, underground mining and ship-loading.

Plants located on the Bay of Fundy are largely compelled to mine below ground level, are faced by the heavy cost of transport from quarry to loading docks, and, at their loading docks, are handicapped by extreme 40-ft. tidal conditions, leaving boats high and dry at the loading docks at low tide and thus providing very short ship-loading periods. Plants now located on the northern shores of the island of Cape Breton on the gulf of the St. Lawrence are handicapped in maintaining their loading piers because their shipping terminals are exposed to the never-ending destructive forces of the North Atlantic Ocean. This condition has required expensive and almost constant dredging.

The Victoria Gypsum Co., Ltd., owns large deposits of gypsum in Cape Breton, and has just completed what is said to be the best-equipped raw-gypsum producing plant in North America. Its property is located on St. Patrick Channel at Little Narrows, Cape Breton, which is on the Bras d'Or Lake, a deep water arm of the sea, navigable to ocean-going ships and extending some 60 mi. inland from Sydney, Nova Scotia, where the tide at the new loading pier rises and falls not more than 2 ft. in contrast to the great tides of the Bay of Fundy, not far distant. The company's loading pier with a 26-ft. depth of water alongside may be approached in any kind of weather during the shipping season.

The property, embracing about 800 acres, contains a deep bed of gypsum covered with very little clay overburden. The high faces available make it possible to mine this material by the open-quarry method at a low excavating expense. The gypsum in this deposit, all above sea-level, is of the highest grade and passes the most stringent chemical-analysis requirements. It will

A general view of the loading pier.



Plan and elevation of boat-loading facilities.

produce a clear, white plaster and occurs in such quantity as to insure supply to the steadily-growing industry for years to come.

The annual exports of gypsum from Nova Scotia to the United States will probably be materially increased with the completion of this Victoria plant. While it is approximately 1,000 mi. east of Boston and New York, the ocean freight rates, as compared with those of the railways bringing gypsum from the southwestern or middle states or even from the state of New York itself, will be favorable to eastern seaboard trade. Since this new plant is located almost one-third of the way to Europe, the English trade is expected to seek gypsum from this shipping point. The plant, therefore, has been designed in the expectation of being required to meet large tonnage demands.

POWER REQUIREMENTS OF VICTORIA GYPSUM CO. PLANT, LITTLE NARROWS, NOVA SCOTIA

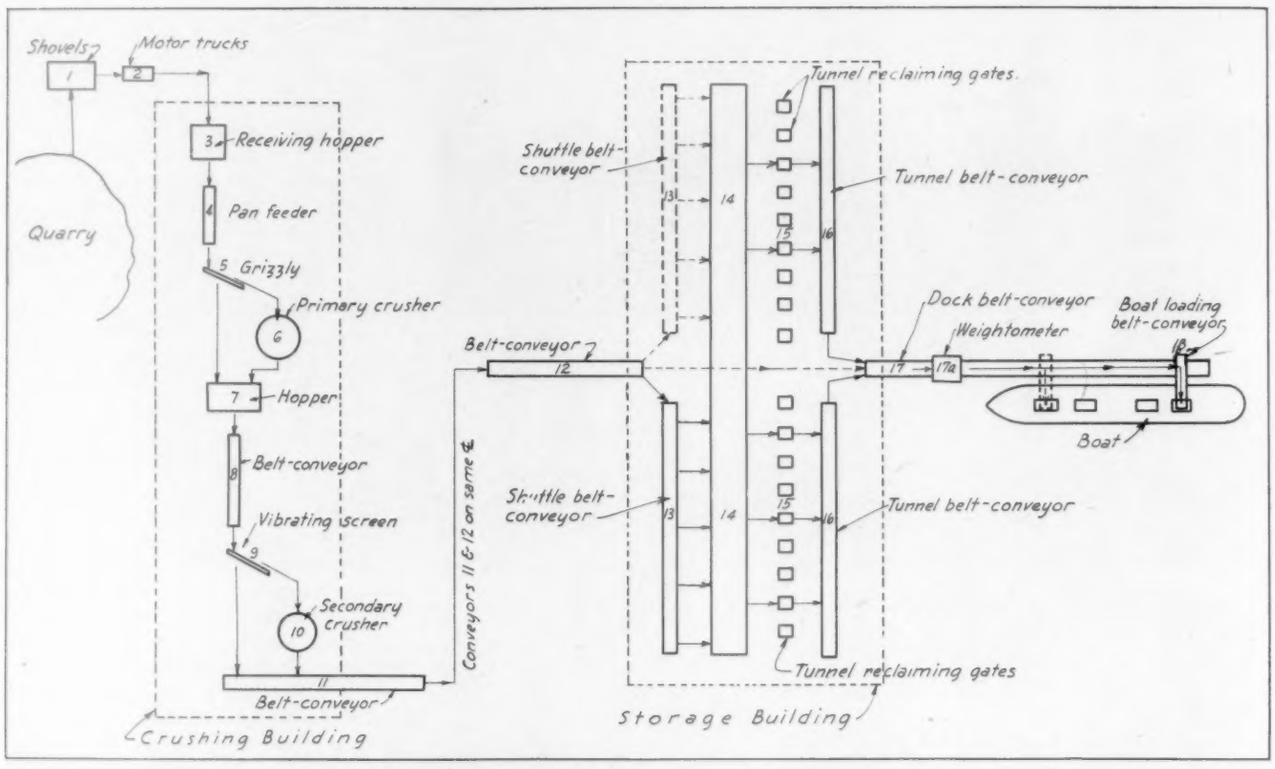
Unit		Present			Future		
No. on Flow-Sheet	Description	Capacity (*tons per hr.*)	Power (*hp.*)	Motor Size (*hp.*)	Capacity (*tons per hr.*)	Power (*hp.*)	Motor Size (*hp.*)
	CRUSHING AND STORING:						
4	Pan-feeder	200	3.0	7.5	400	5.0	7.5
6	Primary Crusher	200	50.0	100.0	400	100.0	100.0
8	Conveyor to screen	200	6.6	7.5	400	13.0	15.0
9	Vibrating screen	200	3.0	5.0	400	3.0	5.0
10	Secondary crusher	100	35.0	75.0	200	75.0	75.0
11	Conveyor to pond	200	19.0	20.0	400	38.0	50.0
12	Conveyor to storage	200	24.0	25.0	400	48.0	50.0
13	Shuttle conveyor over storage	200	4.7	7.5	400	9.5	15.0
	Sub-totals		145.3	247.5		291.5	317.5
	RECLAIMING TO SHIPS:						
16	Reclaiming tunnel conveyors (2)	1,000	24.0	25.0	1,000	24.0	25.0
17	Dock distributing conveyor	1,000	96.0	100.0	1,000	96.0	100.0
18	Shuttle boat-loading conveyor:						
	(a) Shuttle belt	1,000	7.3	10.0	1,000	7.3	10.0
	(b) Shuttle belt in motion		1.5	3.0		1.5	3.0
	(c) Gantry travel		7.0	10.0		7.0	10.0
	Sub-totals		135.8	148.0		135.8	148.0
	Grand totals		281.1	395.5		427.3	465.5

The organization of this enterprise was completed a year ago, after eight years of careful investigation as to the raw-material deposits, the cost of production, the cost of transportation to market, and the market demands for the product. With these factors once definitely determined, a plant costing nearly a million dollars has been constructed and recently put into operation, exactly one year from the date of the start of the designing of the plant and from the time of making the original surveys for construction. This feat in itself constitutes a modern construction record, for the plant has been built in a remote section of a primitive country, miles from the nearest town of any consequence, and 7 mi. from the nearest railroad. Practically all the construction equipment and all the material for construction was either hauled over 7 mi. of rough country roads or was delivered on the shore of the lake at the plant site and brought ashore under difficulty. The plant site presented a dense forest which could not even be surveyed until Canadian woodsmen blazed a path sufficient for transit lines

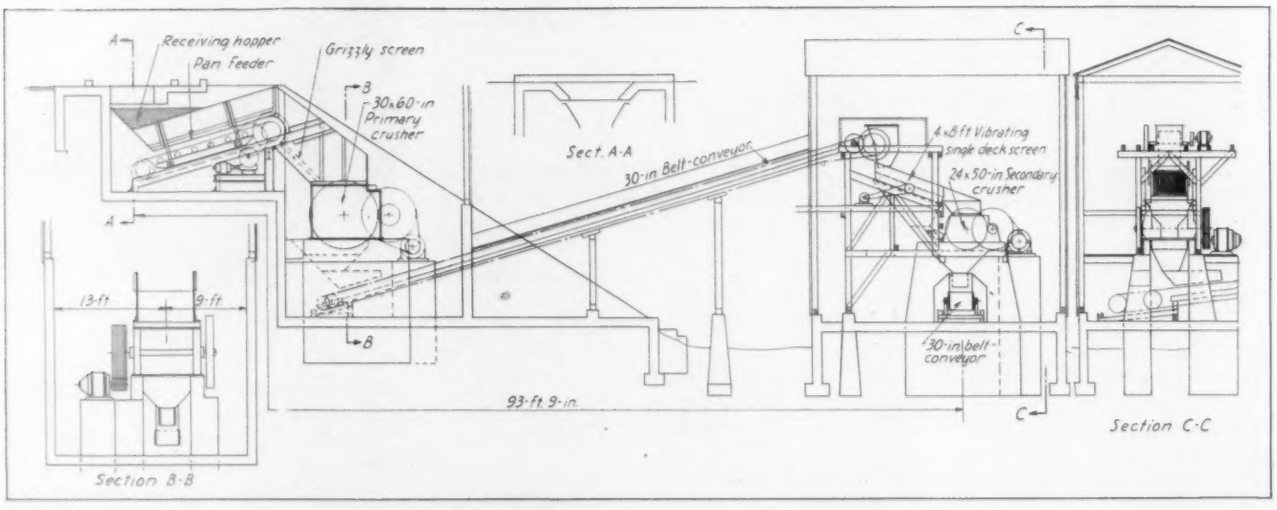
Traveling gantry used to load vessels at the dock.

before the actual clearing for the plant's construction began.

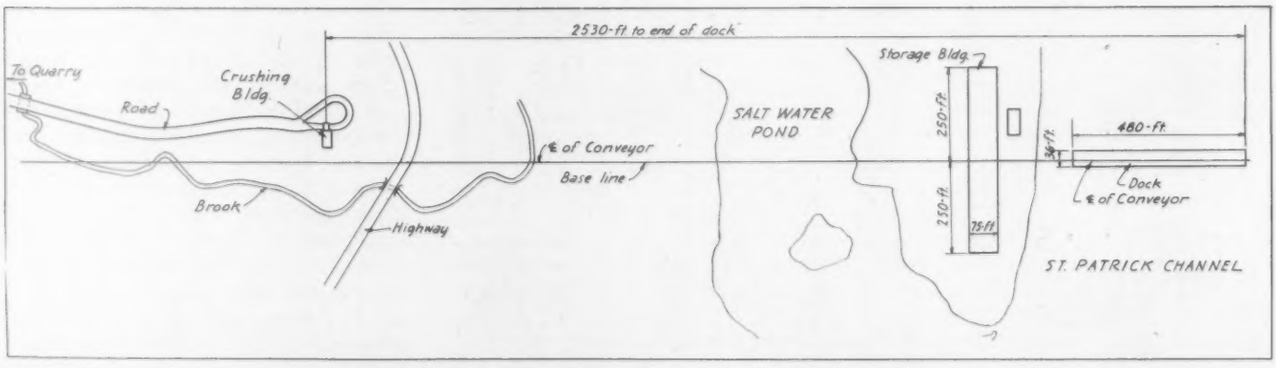
While the country is presumably closed for three or four months in the winter season, construction went on during this period last winter, as is evidenced by some of the accompanying construction illustrations, because it was felt that the demands for gypsum from this plant, justified every possible effort to give this product, not only to the United States market, but to the European market at the earliest possible date. The severe climatic conditions in Nova Scotia had a strong bearing upon the design of this plant, the purpose of which is to quarry and size raw gypsum rock and store it in large quantities for the rapid loading of ships through the producing and shipping season, which extends over a period of nine months of the year. While the shipping season actually closes in December, so that during January, February and March



Flow-sheet of operations of Victoria Gypsum Co., Ltd.



Sectional sketch showing lay-out in the crushing building.



Map of operations. Note straight line traversed by the main conveyor.

no shipments can be made, quarry operation can, if necessary, be begun before the end of March to stock up for the opening of the succeeding shipping season.

Since provision had to be made for a large storage of the crushed gypsum rock in order to load ships at a much faster rate than the normal quarry production rate, the problem centered largely on providing an enormous covered storage building near the loading pier into which the gypsum could be

Conveyor from primary crusher to vibrating screen over secondary crusher.

delivered at leisure and from which it could be reclaimed at a rapid rate. The design of the whole plant lay-out, therefore, became primarily a material-handling problem, involving elevating and conveying machinery from the quarrying and crushing process up to and including the ship-loading process, and was strongly influenced by the irregular contour of the property.

The gypsum deposits, some 3,000 ft. back from the south shore of Bras d'Or Lake, center about a deep ravine, which gradually slopes toward the lake. This ravine, starting at an elevation of about 100 ft. above the lake and dipping toward it, gives a convenient natural water supply, which, as the quarry faces are worked back on either side of the ravine, has been impounded for quarry operations. When once a center line for the entire plant set-up was established, it became evident that the most

A portion of the quarry face after a blast.

View showing how the conveyor lines follow the ground contour.

economical method of transporting materials from the quarry to the ships was to locate the crushing plant close to the quarry so as to crush and size the material immediately and then convey the product the remainder of the distance by means of a continuous belt-conveyor system.

This set-up caused the selection of motor trucks as providing flexible means of bringing the rock from the quarry to the crushing plant over a maximum distance of about 900 ft. The remaining distance of approximately 2,500 ft. from the crushing plant to the end of the shiploading pier is covered by a series of continuous moving belt-conveyors, which follow the irregular profile of the land without cutting or filling and with the least cost for supporting structures.

Two long belt-conveyors are required to carry the material from the crushers to the storage building: one, 1,040 ft.

The primary and secondary crushing plants.

long between centers, which is believed to be the longest belt-conveyor installation in Canada, and another, 775 ft. long between centers. In traversing this distance these units rise sufficiently high to cross a public highway, then drop down as they cross a swampy section of land, where the conveyor structures are carried on creosoted piling, then upward over a plateau, then on piling across a pond some 400 ft. wide, and finally up a 315 ft. incline to the top of the storage

Section of the quarry looking northward.

View of the quarry road under construction.

building. It is interesting to note that from the time a piece of rock is dumped into the receiving hopper above the crushers until it is crushed and delivered in the storage building, only 12¾ min. elapse, and only 3 min. are consumed in the travel of a piece of gypsum from the storage building to the ships.

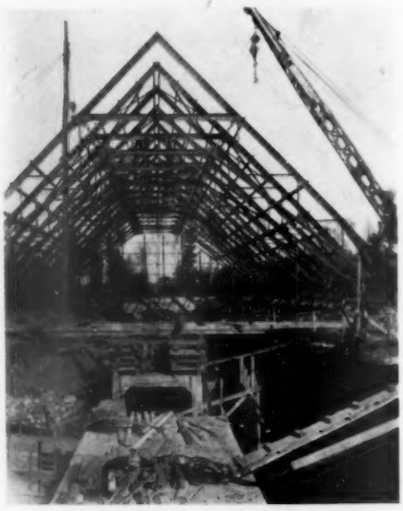
Two 1¼-cu.yd. Harnischfeger Diesel shovels load the raw gypsum rock blasted from the quarry faces into Ford and Maple Leaf motor trucks, which transport it a short distance to the receiving hopper at the top of the crushing plant. This was designed with a view to minimizing the production of unnecessary fines below the desired commercial sizes of the finished product.

A view of Conveyor No. 7 from top of storage building, showing curved aluminum hood.

From the receiving hopper (3 in the accompanying flow-sheet) at the top of the crushing plant the rock is fed by gravity to a heavy inclined manganese-steel pan-feeder (4) for uniformly regulating the flow of rock to a smooth ribbon, before passing it over a bar grizzly (5) located above the primary crusher (6). This grizzly is provided with 4½-in. clear spaces between the bars for by-passing all the material 4½-in. and under before it passes through the primary crusher. This machine, a Pennsylvania single-roll unit of massive construction, reduces all the material above 4½ in. in size and up to 30-in. cubes to a product 4½ in. and under which joins the by-passed material in a hopper (7) below the primary crusher and passes to an inclined belt-conveyor (8) which elevates it to a S-A vibrating screen (9) located over a secondary crusher (10). The screen removes all the material above 2-in. cubes, passing the tailings to a second Pennsylvania single-roll crusher, 24 in. by 50 in., which reduces the remainder of the material to 2-in. cubes. This joins the by-passed flow below the crusher and is fed to the main belt-conveyor system. As both crushers are adjustable to produce different sizes, by simply changing the screen surface on the Vibrator, any size of finished product is obtainable, according to the market demands.

From this point the main trunk-line belt-conveyor (11) carries the material a distance of 1,040 ft. to the edge of a salt-water pond, delivering it there to a second trunk-line belt-conveyor (12), which extends across the pond, and thence up a long incline, elevating the material to the top and central point of the main storage building, which is placed at right angles to the line of travel of the belt-conveyor system.

At the central point the second belt-conveyor (12) delivers the material to a shuttle distributing belt-conveyor (13), located in the top of the storage building. This is reversible in its direction of belt travel, and the entire shuttle unit may be moved in either direction from the central point so as to distribute material to any point over the entire 500-ft. length of the storage building, making it easily possible to store different grades and sizes of gypsum in different sections (14) of the building as desired. The lay-out provides for by-passing the storage building, so that crushed gypsum may be conveyed di-



Reclaiming conveyor tunnel under construction in the storage building.

Conveyor No. 7 crossing pond to storage building. The roof of the storage building may be seen in the background covered with snow.

rect from the crushers to the ships if desired.

The storage building, furnished by the J. W. Cumming Mfg. Co. of New Glasgow, is of an economical and unique design. It provides for a storing capacity of 29,000 tons of crushed gypsum. It consists primarily of a series of main A-frame trusses, spaced 17½ ft. apart on their center lines. It has a clear span of 75 ft. and is carried on heavy concrete piers, the frame being covered with copper-bearing corrugated-metal sheeting to protect the gypsum from the weather. This building is 500 ft. long and is provided with ample ventilators the entire length of the roof for cooling in the summer, and is fitted with windows at each end and doors of sufficient size to admit the entrance of the shovels, if required.

A large concrete tunnel, located in the center of the storage building, extends the full length of the structure. Reclaiming gates (15) with loading chutes are located at 10-ft. intervals below the roof of the tunnel for reclaiming the finished raw gypsum from the storage building by gravity to either one of the two tunnel belt-conveyors (16), each of which carries material toward the center of the building and there delivers it to a dock distributing belt-conveyor (17). This arrangement makes it possible to run one or the other of the two reclaiming belts, or both if necessary, to blend the quality and size of finished gypsum to meet various market requirements.

View of storage building looking south from the No. 12 dock conveyor.

The dock distributing belt-conveyor (17) is provided with a Merrick conveyor Weightometer (17a) for automatically and continuously weighing all the material going to the ships. This conveyor travels from below the center point of the storage-building tunnel on a slight incline for a distance of 287 ft. until it reaches the shore end of the ship-loading pier, and thence horizontally 404 ft., passing through a traveling tripper for delivering its load at any point along the pier to the cross shuttle or boat-loading conveyor (18) for loading the ships.

As the belt-conveyor on the pier is some 28 ft. above the pier floor, the cross shuttle belt-conveyor is high enough above the dock to meet various ship-loading requirements. It is carried in a structural-steel traveling gantry, which spans the dock-conveyor structures and rides on rails on either side of the dock, so arranged as to travel over a distance of 300 ft. The loading shuttle may be stopped at any point along the line for delivering to any one of the holds of the ship. This unit is controlled by one operator located in a house in the top of the gantry structure, sufficiently high above the pier to enable him to observe and control the operation of the entire ship-loading system.

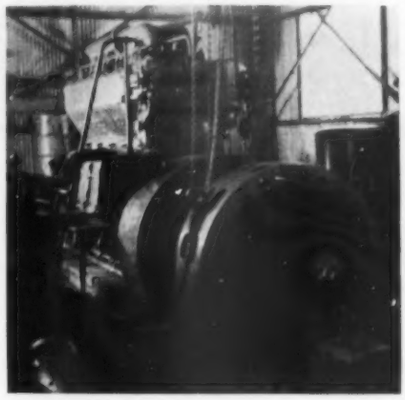
By this design ships are brought alongside the pier and made fast to it during the entire ship-loading process, instead of being placed at the end of the pier, where it would be necessary to move the ships forward and backward as the load is distributed in their various hatches in the process of trimming and loading. This feature is a marked improvement over any other loading facilities now in use in Nova Scotia. Since this traveling gantry shuttle boat-loader, though weighing 77,000 lb., may be moved from hatch to hatch in a fraction of the time that would be required to move a ship, the complete trimming and loading operation is greatly expedited, and requires but one operator and no attention on the part of the ship's crew.

The shuttle belt ship-loader is adjustable to various widths of ship hatches and is arranged to travel from one hatch to another without interfering with the ship's rigging, by raising the aluminum telescopic loading spout, and collapsing the shuttle, giving a clear space alongside the dock for the handling of ships of various kinds.

The pier is 36 ft. wide and 480 ft. long and provides for a 26-ft. depth of water its entire length to accommodate the drafts of 6,000- to 8,000-ton ships, which are the largest expected at this port.

The present plant is designed to crush and store gypsum rock of 2-in. size and under at a uniform rate of 200 tons per hr. All driving connections, sizes of headshafts, gears, etc. are of sufficient strength to allow future increases to an ultimate uniform rate of storing capacity of 400 tons per hr. The motors for driving the trunk-line belt-conveyors to storage will be changed in the future and doubled in size when the plant grows to that capacity, but the motors driving the pan feeder, primary crusher, vibrating screen and secondary crusher are of sufficient size to take care of the ultimate capacity. When future increased rates of capacity are required in crushing and storing, additional shovel equipment and truck equipment will be supplied for the quarry.

Looking northeast along the storage building.



Diesel generating equipment in the power plant.

The reclaiming conveyors and boat-loading equipment are capable of loading ships at a maximum uniform rate of 1,000 tons per hr., and with flood lights provided along the dock for night operation this high rate of capacity is such that a ship arriving at the end of the day, may be loaded the same night and be ready to sail at daylight.

The primary crusher is capable of receiving gypsum rock in 30-in. maximum cubes and under and reducing it to a 4½-in. product and under, while the secondary crusher will reduce the 4½-in. product to 2-in. cubes.

All the belt-conveyors carrying to storage are 30 in. wide, running 175 ft. per min. for the present capacity, and will be increased to 350 ft. per min. when the future capacity is desired. All the belt-conveyors carrying from the storage for ship loading are 42 in. wide and operate at a speed of 450 ft. per min., the conveyor belts being furnished by the Goodyear Tire & Rubber Co. All the belt-conveyors are covered with curved hoods of corrugated aluminum to protect them from the weather. All the belt-conveyors are supplied with Stephens-Adamson Mfg. Co. Pacific

The steamship "Fernorth" unloading machinery for the new plant.

type, Style 234, 3-pulley, troughing carriers. The rolls are 6 in. in diameter and are mounted on low-friction roller bearings.

The crushing and conveying equipment for this plant is driven by means of individual motors.

Since there was no source of electric power in this section of the country, a study of the power requirements from the various angles of fuel supply, cli-

Dump trucks delivering rock from quarry to dump hopper at crusher house.

matic conditions, etc., was necessary. This resulted in the selection of Diesel-engine generating units to provide power for the various motors of the crushing and conveying system and for artificially lighting the plant.

The power-station equipment was shipped to the plant from England, and consists of a 250-hp. Ruston 5-cylinder, 4-cycle Diesel engine running 400 r.p.m., which was supplied with an alternator, a compressor, pumps, transformers and all electrical appurtenances, furnished by Wm. Stairs, Son & Morrow, Ltd., of Halifax. This equipment was received by water after the dock was completed and was unloaded from the ship to the dock for placing in the power-station, behind which are located large tanks for the fuel oil, which fuel will be delivered by water as needed.

The lighting circuits are fed from the main lines when the plant is operating, or from an auxiliary Diesel-engine lighting set in the power-plant when the big generator is off the line. All the motors for the crushing and conveying units, together with the interlocking control systems, etc., were supplied by the Canadian General Electric Co.

The supports for all the conveyor structures are largely of timber construction, as it was felt that no more structural steel than was necessary should be used because of the high maintenance cost due to atmospheric conditions in this mid-ocean country. All the conveyor structures, therefore, are of long-leaf yellow pine, which was imported into the country as no local timber of durable quality and strength was available.

The loading pier is of wood-pile construction, creosoted piles being necessary because of the presence of destructive teredos in Nova Scotian waters. The dock superstructure is of the highest grade long-leaf yellow pine and was shipped to the job by boat from Boston supply yards.

All concrete and masonry work for the plant, together with the construction of the pier, was handled by the A. S. MacMillan Construction & Lumber Co. of Halifax, and the conveying machinery equipment, structural-steel buildings and electrical apparatus was purchased from Canadian sources of supply. The Diesel-engine generating set was manufactured in England. The Stephens-Adamson Mfg. Co. of Belleville, Ontario, developed the details of the structures supporting the conveying machinery, which was fabricated in its Canadian factory.

The core drills, jack-hammers and compressors used in the quarry were furnished by William Stairs, Son & Morrow. The Harnischfeger Corp. supplied the Diesel-engine shovels. The motor trucks are of Ford and Maple Leaf manufacture.

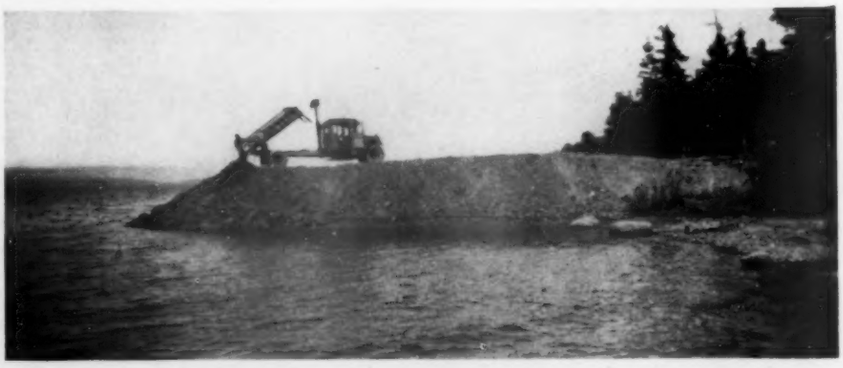
The Stephens-Adamson Mfg. Co. made the receiving hopper, the pan feeder, the bar grizzly, the vibrating screen, all the belt-conveyors, the tunnel loading gates and the gantry boat loader.

The auxiliary structures such as the crushing building, the power-plant building, the fuel-oil storage, the repair shop and storehouse, garage and office building were erected by the gypsum company's construction forces and under subcontracts with local contractors.

R. W. Green of New York is president of the company, Norman S. MacMillan is the treasurer, and the general manager in charge at Little Narrows is Edwin F. Burnham, long experienced

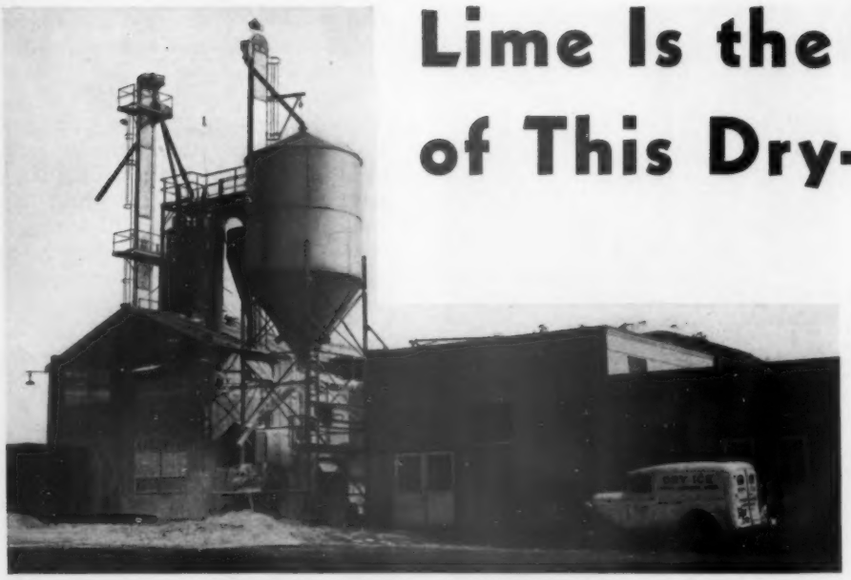
Bringing in 2,000 ft. of 30-in. conveyor belting in the height of winter.

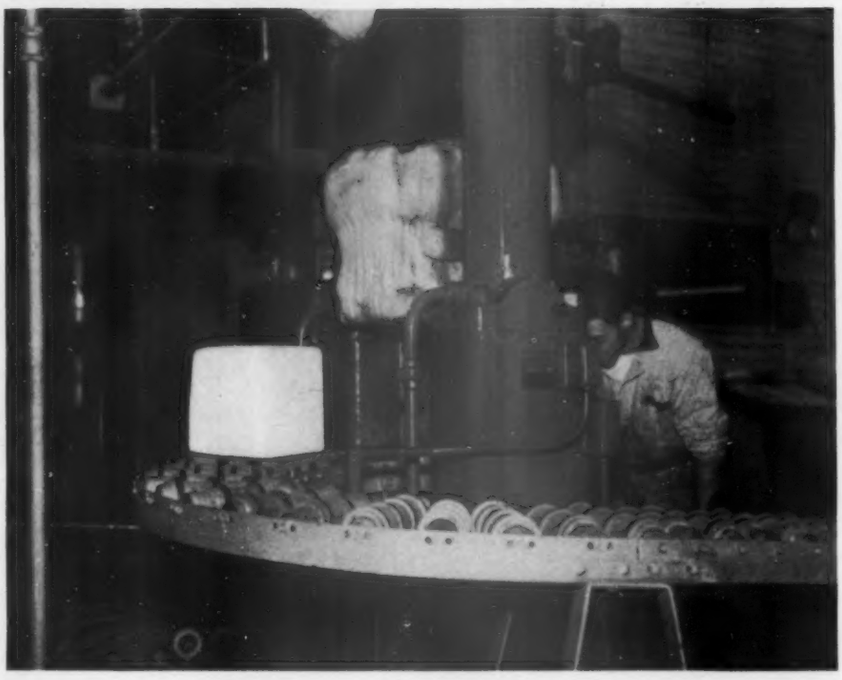
in industrial chemical enterprises. C. R. Fancy, with many years of experience in gypsum production in Canada and Nova Scotia, is production manager. The plant was designed by R. A. McMullin, manager of the New England branch of the Stephens-Adamson Mfg. Co., who acted as project engineer in charge of the plant construction.



Constructing the fill at the land end of the dock.

Lime Is the By-Product of This Dry-Ice Plant





At the top is a view of the plant of the Frozen Carbonic Corp. with lime plant at left and dry-ice plant at right. Below is the snow press which makes the dry-ice cubes.

By W. E. TRAUFFER

FOR many years lime- and cement-plant operators have been experimenting with the production of dry ice from carbon-dioxide gases created in their burning or calcining operations. The prospect of converting a waste gas into a profitable product was responsible for much costly experimentation but as yet only a few producers are successfully manufacturing such a product. The difficulty and expense of removing impurities from ordinary kiln gases has been the chief obstacle.

One of the most successful systems for the production of CO_2 to be converted into solid carbon dioxide is the Gillette system which was developed by the Gillette Research Corp. of Toledo, O., through many years of intensive research and development. This system differs from others now in use in that lime is burned in a special kiln by indirect heat which prevents contamination of the carbon-dioxide gas by the fuel. An experimental plant, which was operated for several years on the property of the Woodville Lime Products Co. at Woodville, O., demonstrated the ability of this system to produce practically pure carbon dioxide with lime as a by-product. It also showed that this could be done in commercial quantities at a cost comparing favorably with other methods. The author was privileged to observe this plant in operation and described it in an article published in the September, 1933, issue of PIT AND QUARRY.

Several installations of the Gillette system have since been made and one of these is described in this article. The Frozen Carbonic Corp. was formed in 1934 to produce dry ice and after six months' study of the various methods in use began the erection of a Gillette system plant on Neville Island, near Pittsburgh, Pa. The plant went into operation in the Spring of 1935 and both solid carbon dioxide and lime were in commercial production by May of that year. In the succeeding eighteen months the usual operating difficulties and refractory problems were overcome and the efficiency of the plant improved to the point where it is now producing 8 to 10 tons of solid carbon dioxide and 14 to 16 tons of lime in 24 hr.

Most of the lime has been sold to local industries for from $7 to $9 per ton and some of the off-grade or underburned lime to farmers for $2 or $3 per ton. The income from lime sales has made possible the delivery to the dioxide plant of CO_2 with a purity of 98.5 per cent. or over approximately free of cost. The refrigerant is sold in 10-in., 50-lb. cubes for from $50 to $70 per ton delivered. At present most of it is used for refrigerating trucks in which perishable foodstuffs are shipped. Ice-cream delivery trucks use a large part of the production. The product is also being used as a booster in water-cooled railroad refrigerator cars to eliminate the necessity of re-icing in transit on long hauls and it is said that when meats are hauled the carbon-dioxide gas given off also acts as a preservative. The latter market has been only slightly developed and offers vast possibilities for the future of the dry-ice industry.

The plant is located adjacent to the property of the Pittsburgh Coke & Iron Co. from which is obtained the by-product coke-oven gas used as fuel. This gas has a fuel value of about 550 B.t.u. per cu.ft. and about 175,000 cu.ft. are required for 24 hours' production.

Limestone is the only raw material used in this process and can be either high-calcium or dolomitic, depending on the type of lime in demand. Dolomitic stone is preferred because of its easier burning and higher CO_2 availability. Twenty-five tons of dolomitic

stone yield about 15 tons of lime and 10 tons of gas, while the same quantity of high-calcium stone yields 10 to 15 per cent. less carbon dioxide and proportionately more lime. There is no loss in burning as the stone is heated in a closed retort. Most of the dolomitic lime is sold to glass plants and the hightors and to the chemical industries. The size of the stone used is limited by the calcium lime to electric-furnace operasize of the retort tubes and the best results are obtained with stone carefully sized between the limits of ⅜ and ¾ in.

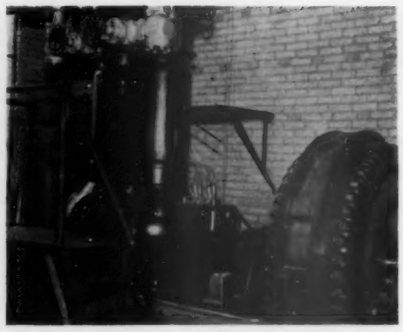
The limestone used is discharged from hopper cars into a track hopper from which it is reclaimed by a Jeffrey pan conveyor. This discharges it to a Jeffrey steel-inclosed belt-bucket elevator which drops it through a selective

Pan conveyor from track hopper and elevator to storage.

three-way spout. One spout discharges the stone to a stock-pile from which it can be reclaimed through the track hopper. The second spout discharges the stone into a 100-ton circular steel storage bin from which it can be dropped by gravity to the above-mentioned elevator. The third spout discharges the stone direct into the 10-ton feed hopper on top of the Gillette vertical kiln.

This kiln has four carborundum tubes or calcining chambers 30 ft. high

Pulverizer used in the production of special ground lime.

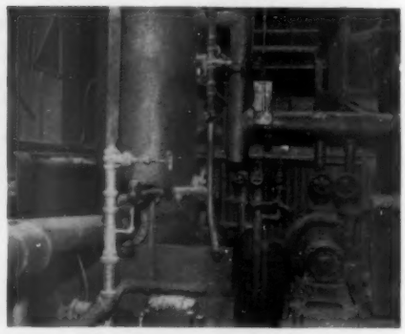


One of the compressors used in liquifying the carbon-dioxide.

with inside dimensions of 2½ in. by 28 in. Carborundum, it has been found, does not combine with the lime and its high heat conductivity is an advantage in indirect burning. The stone passes by gravity from the kiln-feed box into the four burning chambers. Each tube or chamber is fitted with a variable-speed rotary discharge feeder which seals the tube and also controls the rate of discharge.

These tubes radiate at right angles from the center of the kiln and inclose four separate firing chambers. These are lined with fire-brick and have Bigelow-Liptak suspended-arch furnace-wall construction. Each firing chamber has an individual air-mixing gas-burner and an individual stack with natural draft. A temperature of from 2,000 to 2,200 deg. F. is maintained. Any adjustments necessary to insure even burning of the lime are made at the discharge feeders. Each retort tube is sealed at the bottom by its feeder and at the top by the column of stone. There are instruments which record the temperature and the CO_2 percentage.

The feeders deposit the lime on an inclined Jeffrey pan conveyor which can discharge to a steel-inclosed chain-bucket elevator or into a small Jeffrey pulverizer. This pulverizer is used only when glass lime or pulverized dolomitic lime is produced and discharges its product to the elevator. The elevator feeds a 75-ton circular steel storage bin



One of the CO_2 water-scrubbing tanks with connection to kiln at right.

from which lime is loaded into cars or trucks for shipment. When loading box-cars, a Sinden belt-loader supplements the gravity-loading system.

The CO_2 is withdrawn from the four firing chambers by suction through four water scrubber tanks and a master scrubber tank. The same fan blows the washed CO_2 into a 3,000-cu.-ft. steel gas holder located between the lime and dry-ice plant buildings. In the dry-ice plant

(Continued on page 62)

Another view of the plant with dry-ice building at left. Above at left is lime-storage tank and at right is stone storage. Top of kiln is in center and below is CO_2 storage tank.

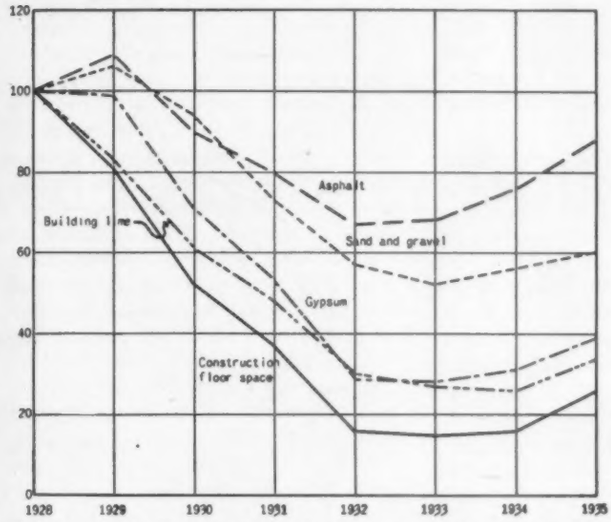


Fig. 1. Trends in production of asphalt, sand and gravel, building lime and gypsum compared with construction floor space, 1928-1935.

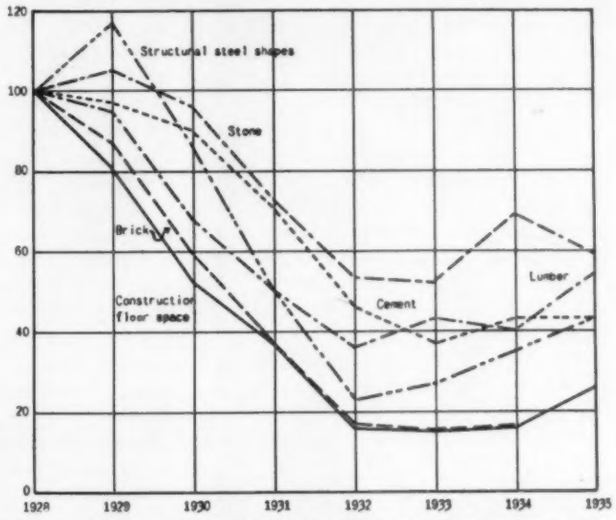


Fig. 2. Trends in production of structural-steel, stone, cement, brick and lumber compared with construction floor space, 1928-1935.

COMPARATIVE TRENDS IN THE USE OF MATERIALS IN CONSTRUCTION*

By CARL A. GNAM
Nonmetal Economics Division,
U. S. Bureau of Mines

THE construction industry normally consumes vast quantities of materials, many of which are of mineral origin. Figures collected by the Bureau of the Census indicate that of the total expenditures for construction in 1929, 39 to 45 per cent., depending on the kind of construction, was paid for materials. The magnitude of this market may be judged from the annual volume of construction. Activity reached a low point in 1933, when the total value of construction in the United States was estimated at about $3,500,000,000, but subsequent increases indicate a total of about $5,000,000,000 in 1935, and a substantially higher volume will be obtained in 1936. There is a rather definite prospect, therefore, of an expenditure this year of around $3,000,000,000 for sand and gravel, stone, cement, lime, gypsum, clay products, iron and steel, lumber, and other construction materials. Because of the great importance of this outlet for mineral products attention is focused on the current trends toward expanding or diminishing uses of the various materials.

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General Trends.—The prosperity of the industries producing the materials mentioned is directly dependent upon the volume of construction. At the present time that volume is relatively small, but it is increasing, and there are many indications that the long construction cycle is definitely directed toward more prosperous levels. Residential building has been making tremendous gains in the last year. This has been stimulated by a real need for more homes coupled with incentives such as rising rents, increasing costs of materials and labor, lower interest rates, government guaranteed loans, and larger incomes. Also the agitation for low-cost homes and Government subsidies for housing the very low income groups may bring forth an entirely new market in this class of construction. Industrial building has expanded with the recovery of industrial production, which has about reached the 1923-25 average. Public works, even with the comparatively large expenditures of the Federal Government, has been in the last two years only about two-thirds of the average volume for the years 1927 to 1931, inclusive. This type of construction will increase substantially when state, county and local governments are again in a position to make normal expenditures. Public utilities accounted for an estimated $1,500,000,000 of construction in 1935, registering an increase for the second time since 1933, but another $2,500,000,000 is needed to arrive at the volumes attained in the years 1926 to 1930.

Whatever improvement takes place will accordingly benefit directly the producers of construction materials. Furthermore, the relation of construction, with its wide ramifications, to the general economic condition of the nation is of even greater significance. An indication of this far-reaching effect is gained from a statement in a report published in 1933 by the Construction League of the United States in which it was said "that in 1929 the production of construction materials employed every tenth manufacturing worker, that the fabrication went on in a quarter of the country's factories and mills, that one of every five carloads of freight car-

ried construction materials, that 8 per cent. of the wholesalers of the country were busied with the distribution of construction goods, that 5 per cent. of all the coal mined was burned to produce these materials."

The accompanying charts, based on index numbers which are percentages of the 1928 quantities, indicate the trends in the production of the principal construction materials, and in square feet of building-construction floor space during the years 1928 to 1935, inclusive. Within these years are included the peak of construction, 1928, and the depression "low", 1933. It will be observed that with the exception of lime, all the low points were reached in either 1932 or 1933, and with a few exceptions the trends have been upward during 1934 and 1935. Not one of the commodities fell below the level of construction, although the brick index occupied the same position in 1931 and again in 1933. The wide separation of the indexes for such materials as asphalt, stone, cement and sand and gravel from the index of floor-space construction is due to their large use in engineering construction, for which no quantity index is available for comparison.

The following paragraphs comprise a brief survey of conditions and trends in individual commodities.

Stone.—The amounts of stone from which the index was computed include both dimension and crushed stone, the latter representing annually about 97 per cent. of the total. Moderate amounts of stone for monumental, metallurgical, agricultural, and manufacturing purposes are included, but most of the remainder is used for some type of construction. Usually between 50 and 60 per cent. of the total is accounted for by crushed stone for concrete and road metal, and it was the increase of nearly 15,000,000 tons in that classification in 1934 and the decline of about 9,000,000 tons of the same material in the following year that were responsible mainly for the unusual fluctuation of the trend line in those two years. The production of this class of stone in 1935 was only about 62 per cent. of the 1928 amount.

Building stone, that is, dimension stone used for facing, trim, roofing, floors, decoration, and other architectural purposes, exerts very little influence on an index of the total quantity of stone produced, but the value of such stone constitutes an appreciable part of the total value of stone sales. In 1935 the tonnage was 1 per cent. of the total and the value 8 per cent., but in 1928, when the tonnage accounted for a little less than 2 per cent. of the total, the value was 21 per cent. of that of all the stone sold. The high costs of fabrication, shipping, and labor for setting this type of stone have been responsible for its curtailed use in the past few years when expenditures for building were greatly limited. Sales of dimension stone reached in 1934 about the lowest point in their history.

Sand and Gravel.—The sales of sand and gravel are principally for construction purposes. Some sand is used for glass manufacture, molding of iron and steel, and grinding and polishing of plate-glass and dimension stone, for filtering and other miscellaneous purposes, but practically all the gravel and consequently most of the combined production of sand and gravel is used for building or highway construction. Usually more than half is used with cement in concrete. The decrease in concrete highway construction has curtailed the demand from that source, but this apparently has been offset by the wider use of gravel in concrete for other purposes. Increases in the lighter and lower cost types of highway construction have also contributed to the rising production in the last two years.

Cement.—The comparatively low level of cement production is due principally to curtailed concrete-pavement construction. Less expensive types of road surfacing have been favored in the past few years, when expenditures have been limited. Were it not for the improvement in building construction and the increases in Federal allotments for many types of engineering projects, the demand for cement would be considerably lower.

The following table, based on studies made by engineers of the Portland Cement Assn., gives estimates of Portland-cement distribution in the United States in 1934, by uses.

Use	Percentage
Structural concrete in buildings of all types	26.3
Concrete roads, streets, alleys, curbs, gutters, and pavement bases	24.4
Bridges, river and harbor works, dams and water-power projects, storage tanks and reservoirs	19.8
Rural uses exclusively, including farm structures	8.5
Railways, all uses, including street railways	7.2
Sewerage, drainage, culverts, and specialties	7.9
Concrete products, except products used on farms	3.3
Sidewalks and private driveways (exclusive of rural)	2.6
	100.0

Gypsum.—Most of the gypsum produced is used for building purposes in the form of plaster, plaster-board, lath, wall-board, partition tile, roofing tile and insulating materials; relatively small amounts are used in agriculture, the manufacture of plate glass, terra cotta, pottery, and for other uses. A large tonnage of uncalcined gypsum is sold to cement manufacturers for use as a retarder and therefore reaches the construction industry indirectly. Consequently, the trend of the industry follows rather closely the index of building. The widely-spread occurrence of the mineral and the relative ease and cheapness with which the products can be transported make gypsum a keen competitor in the markets for construction materials. Gypsum wall-board, lath, and partition tile have, during recent years, displaced wood and other products quite extensively.

Lime.—The steady decline in the production of lime from a "peak" in 1925 to a low point in 1934 was influenced considerably by the diminishing sales of building lime, which represented 52.1 per cent. of the total in the "peak" year, and only 21.3 per cent. in 1934. However, the change in percentage is due partly to a wider use of lime in chemical and other manufacturing industries, which held sales for such purposes relatively higher than those for construction. Also there was only a moderate fluctuation in the use of agricultural lime during the depression years. The increase of 32 per cent. in the volume of building lime sales in 1935, as shown in Fig. 1, reflects a greater demand from the construction industry for mortar, masonry cement, and plaster—a demand that will be further accelerated with the prospective continued increase in the volume of building, especially that classed as residential.

Brick.—Brick is used principally in building construction and to a smaller extent in highways, bridges, and culverts. In 1929, according to the Census of Construction, $18 of every $1,000 expended for construction was spent for brick, and this accounted for a larger part of the cost of commercial buildings than of residential. The study of the National Recovery Administration mentioned above indicates that there has been some displacement of brick by cement and stone, and it is evident that although the index for brick has not fallen below that of construction during the years covered by the chart, it has not maintained as high levels as the other commodities. The 1935 production figures for all types of bricks are not yet available, but the index of face brick shows a gain of 35 per cent. over 1934, which is a decided improvement, although the volume of production in 1935 was still only a fifth of the average for the years 1926 to 1928, inclusive.

(Continued on page 54)

By **FRED A. FINKELDEY**
Member, American Concrete Institute

A Lesson in Building from Ancient Rome

Cross-section of the old Roman Aqueduct built 1800 years ago. It was dug up in Germany by the author and is reported to be in excellent condition.

THE Journal of the American Concrete Institute [1] contains several articles concerning concrete restoration in water-impounding structures and concrete maintenance which reveal a very high understanding of the subject matter. Taken collectively, these articles are educational as well as warning. The many suggestions given for the restoration of destroyed concrete, as well as for maintenance of concrete structures, should certainly be considered for new concrete work in order to prevent concrete destruction and to limit the work and expense of maintenance. I fully appreciate the scientific and practical manner in which the above-mentioned articles are published, as it will be a great step forward if these suggestions should be considered carefully and seriously in the building industry.

A very important factor seems, however, to have been neglected. This is recognition of the fact that the density of concrete is more important than its tensile and compressive strengths. Without a doubt a dense concrete is more resistant to aggressive solutions, *i.e.*, cement-destroying matter, and to freezing and thawing conditions. Porous concrete allows attacking solutions to penetrate the structure thereby destroying the concrete from within as well as from without. Also, porous concrete allows water to penetrate and destroy the structure during freezing temperatures by the enormous pressure exerted by the ice formation within.

A proposed protective coating of a structure to overcome the weakness of porous concrete is an uncertain method of protection, especially for long periods, as such a coating is likely to crack from vibration and other causes and will allow water and aggressive solutions to penetrate, resulting in destruction inside the structure without visible outer evidence. There are on the market many chemical compounds for use as admixtures to cement and concrete to overcome the porosity of concrete. Some of them are useful while others may be worthless, but even the best of these admixtures are dependent on a very careful mixing with the cement or concrete batch.

I agree with Lambrecht in his statement contained in *Concrete Restoration in Water-Impounding Structures* [2] that construction speed, cheap materials, and cheap labor are responsible for the enormous economic losses resulting from the destruction of concrete structures. To the question raised by Lambrecht in the above-mentioned publication—"Can anything be done of a permanent nature or even a semi-permanent nature to overcome this menace"—I firmly believe I do not say too much when I answer—"Yes," and I will, in the following paragraphs, endeavor to prove the correctness of that answer.

Nearly two thousand years before Portland cement was known to the building world, the old Romans built in their own country and in middle Europe—Germany and France—structures of many kinds which to this day are still withstanding attacking weather conditions, including countless freezing and thawing cycles, as well as destructive aggressive solutions. There is, for example, a piece of an aqueduct 1,800 years old, exhibited in the Federal Museum in Washington, D. C. This piece of aqueduct was excavated by the writer in the western part of Germany seven years ago and shipped to Washington. The aqueduct from which this piece was taken has a height of 5 ft. and was 60 mi. in length, built from the Eifel to Cologne. This enormous aqueduct is as a whole in perfect condition with the exception of several places where it has been destroyed by man for the purpose of road and railroad construction, etc. Why, then, should it be impossible to erect permanent concrete structures now, having at our command highly-developed technical and scientific methods, while our ancestors with their primitive methods constructed such durable concrete structures? What is the secret of their success? There is no secret.

The Romans used as a binder for their concrete a Puzzuolan-lime cement, sand, and graded aggregates. The proportion of the Puzzuolan-lime cement to the sand necessary to produce a mortar was so selected that the cement filled the voids in the sand and the combined mortar filled the voids in the aggregates. An excessive amount of water was not used for the reason that no segregation is visible and no "honey-combed" spots are to be found, which is evidence that the concrete was well mixed and placed.

It is unnecessary and impossible to go back to the old Roman building methods to obtain equal results, but it is necessary and possible to use in the right proportions a suitable cement, clean sand, clean, good and graded aggregates together with proper consistency, sufficient mixing, careful placing and curing to obtain such results.

The quantity of the cement used should be sufficient to fill all the voids in the sand. To determine the voids in the sand any well known method can be used, so it is unnecessary for me to go into details here.

If we should, for instance, determine that the sand has 35 per cent. voids, we would have to use this quantity of cement by volume plus a reserve of sixtenths or 21 per cent. in this case for a coating of each particle of sand. For example, we will take 100 parts of sand

[1] Vol. 7, No. 5.

[2] Journal, American Concrete Institute, Vol. 7, No. 5.

plus 35 parts of cement to fill the voids in the sand plus 21 parts of cement to cover each particle of sand, or 100 parts of sand and 56 parts of cement.

This material should be mixed dry. The next step is to determine the proper quantity of mortar needed for the concrete. First, we determine the voids in the aggregates after the aggregates have been graded and properly mixed within themselves. If, for instance, it is determined that the voids in the aggregates are 30 per cent., we will have to use to fill these voids 30 per cent. of the mortar described above plus six-tenths to coat each piece of aggregate with mortar. For example, we will take 100 parts of graded aggregates with 30 per cent. voids plus 30 parts of mortar to fill the voids in the aggregates plus 18 parts of mortar to coat each piece of aggregate, or 100 parts of aggregates and 48 parts of mortar. The mortar and aggregates should be thoroughly mixed in their dry condition before the necessary water is added. After the water is added, mixing has to take place until no dry particles remain. Such handling will increase the mixing cost of the concrete but will in the long run create a saving in maintenance costs.

A question might arise as to what kind of cement would be most suitable to make a dense concrete. Based on my own research work and practical experience, and knowing the great advantages of a Portland-Puzzuolan cement used throughout the world, especially in European countries, I suggest the replacing of straight Portland cement by a first-class Portland-Puzzuolan cement. Such a Portland-Puzzuolan cement should contain not less than 28 to 30 per cent. of SiO_2 and not more than 50 per cent. of CaO and should be produced by using 70 to 80 per cent. of sound Portland-cement clinker and 20 to 30 per cent. of activated silica. The siliceous additive should not be admixed to the finished Portland cement but it should be interground with the clinker to secure a homogeneous character.

Such a Portland-Puzzuolan cement will have the following advantages over a straight Portland cement:

1. Greater resistance to seawater and other aggressive solutions, because of its greater density and the higher content of active silica, which active silica combines with the lime liberated during hydration.

2. Greater resistance to freezing-and-thawing damage, because of the greater watertightness and greater density of the concrete in which this cement is used.

3. Greater volume and, therefore, better qualification for filling the voids in the concrete.

4. Increased plasticity and, consequently, better workability.

5. Increased elasticity and lower temperature during setting and hardening time, thus affording greater protection against the formation of cracks in the concrete.

6. Greater waterproofness, watertightness and airtightness.

7. Increased durability of the resulting concrete.

8. Increased tensile and compressive strengths, especially for later periods (7 days and up).

9. Better grinding and more micron fineness.

10. Increased protection against efflorescence on constructions.

11. Increased stability during long storing periods.

12. Greater adhesiveness to iron and steel.

13. Increased fireproofness of concrete structures.

Portland-Puzzuolan cement is used, compared to other cements, in only small quantities in the United States but this should be no reason to overlook the advantages of this cement over straight Portland cement. In European countries Portland-Puzzuolan cement is preferred for mass-construction work, such as dams, harbors, canals, sewers, sluices, fortifications and recently for roads as well as for all other kinds of concrete-construction work. The writer has no knowledge of structures built by using Portland-Puzzuolan cement ever having been destroyed or even damaged in contrast to countless other building structures destroyed by concrete disintegration causing death and disaster.

Construction Trends

(from page 52)

Asphalt.—Asphalt is used almost entirely for construction purposes, the greater part for road building. The trend of production has been upward since 1932, but the low point reached that year was relatively much higher than that of other construction materials. The favored position held by asphalt during the depression years was due to its easy application to repair work by rather inexperienced workers, and to its relatively low cost, which promoted an extensive use of asphalt road materials where limited allotments for street and highway construction were being spread as widely as possible. Asphalt is used for building construction mainly in the form of roll and shingle roofing, brick siding, waterproofing, mastic, paints, enamels, japans, and lacquers. For road building it is used in solid, semisolid, and liquid form. Asphalts liquefied with petroleum distillates (cut-back asphalts) and asphalts emulsified with water are used both for surfacing and, to a lesser extent, for general building construction.

Lumber.—Lumber has always occupied a prominent place among building materials in America, and in the early days when it was available for the effort of cutting and shaping to suitable form it was inevitable that it should be the predominant material. However, as the sources became more remote and the manufacture of competitive products developed, the selection of materials entailed a consideration of their relative values. Mineral products offered an inherent stability, and the natural resistance of such materials as brick, steel, concrete, stone, lime, and gypsum to fire, insects, and decay became of real importance. A statistical aspect of the situation is contained in a recent study by the Division of Review of the National Recovery Administration in which it is indicated that 60 to 70 per cent. of the lumber produced is utilized in construction, and that over a long period of years there has been some displacement by other major building materials.

Metals.—A relatively small percentage of the production of metals is used directly in construction. The census of 1929 shows that 14.3 per cent. of the copper, 19.9 per cent. of the iron, and 13.0 per cent. of the lead produced in that year were used in construction. Since that time considerable effort has been put forth by both copper and iron producers to obtain a greater share of the construction market, and this has been especially noticeable in the residential field, where experiments with prefabricated homes have been given much publicity.

Steel.—The index numbers for steel are those of structural-steel shapes. Many other iron and steel products are consumed by construction, but structural-steel shapes are the largest single item, and very little change in the index would result from including other classifications. The principal demand for steel is in large factory and commercial buildings and heavy engineering projects, therefore such types of construction have a dominant influence on general trends in sales of steel to the building trades. As shown in Fig. 2, except for the years 1929 and 1933, the trend in the production of structural-steel shapes corresponds with that of other materials. The rise in 1929 and again in 1933, contrary to the general trend, appears to have been influenced by the construction of industrial buildings, which also reached a peak in 1929, and began to recover in 1933.

The Eugene Sand & Gravel Co. plant. Crushed gravel is stored in bins at the left; uncrushed gravel and sand at the right.

Motor truck converted for use on rails spotting cars over the track hopper.

Jaw and disk crushers, with bucket-elevators to the screens.

One of the two double-decked vibrating screens used to size crushed gravel.

Oregon Gravel Producer Converts Motor Truck for Use on Rails

By W. E. TRAUFFER

THE Eugene Sand & Gravel Co., Eugene, Ore., has been operating under that name for fourteen years. During most of that period two sand and-gravel plants in and near Eugene were operated but in 1934 one of these was abandoned and the other rebuilt and enlarged. This plant, located almost in the heart of the town, was put back in operation in April of that year with a capacity of 50 cu. yd. per hour. The unusually wide range of sizes produced includes concrete gravels and sand, oil rock, ballast, etc.

Sand and gravel are obtained from a bar in the Willamette River which is submerged during high water. This is an inexhaustible source of supply as the material removed during the year is replenished during the flood periods. A 3-cu. yd. Sauerman Crescent scraper delivers the material to a hopper on shore. This scraper, which is operated by a 100-hp. electrically-driven hoist, was installed late in 1935. Material is discharged from the hopper into a train of two bottom-dump cars. These are hauled about ½ mi. to the plant by a converted Mack truck. Conversion of this truck to rail operation was accomplished at a cost of about $500 by locking the front end and replacing the truck wheels with flanged steel wheels. The truck body is loaded with gravel to give the drive wheels ample traction.

At the plant the gravel is discharged from the cars into a track hopper. An apron-feeder discharges from the hopper to an 18-in. inclined belt-conveyor operating on 187-ft. centers. Material is discharged from this conveyor into a cross flume where water is added. This flume has Goodyear rubber lining which, according to officers of the company, far outlasts steel and is easy to install. At the time the writer visited this plant over 100,000 cu. yd. had passed over this lining with no visible sign of wear.

Following the flume is a conical revolving scalping screen which removes gravel over 3 in. in size and discharges it into an 8-in. by 36-in. Universal Crusher Co. No. 836 jaw crusher. The crusher product (2-in. minus) goes by a belt-bucket elevator to a 3-ft. by 6-ft. Link-Belt double-deck vibrating screen. This is followed by a 30-in. by 12-ft. Russell double-deck shaker screen. All sizes produced go direct to storage as crushed gravel.

The material through the scalping screen (3-in. minus) goes to a second revolving screen which removes sand and concrete gravel up to 2 in. and discharges them direct into bins except the sand which is first passed through a Link-Belt sand-drag tank. The 2- to 3-in. gravel from this screen goes to a

(Continued on page 57)

Diesel-powered dredge of the Tecumseh Gravel Co. Dewatering bins and plant in distance.

DIESEL POWER SAVES $40 DAILY

THE Tecumseh Gravel Co., of Tecumseh, Mich., which has operated a sand-and-gravel plant at the same location for the past 19 years, has had an unusually wide experience with both Diesel-engine-generated and purchased electric power. The plant was originally electrically operated. About 12 years ago a 100-hp. horizontal-type Diesel engine, which is still operating economically and has given very little trouble, was installed. This plant has been enlarged since this engine was bought and the additional equipment beyond the power range of the engine is driven by individual electric motors.

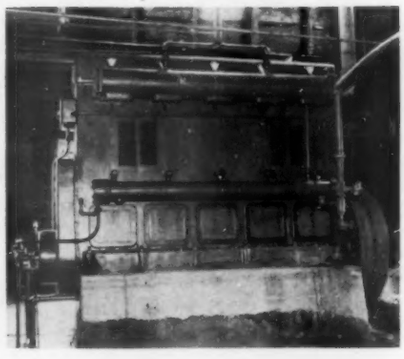
The suction dredge operated by this company was built 11 years ago and was originally operated by a Diesel engine. In 1932 the dredge sank and when it was raised and rebuilt electric motors were installed. During the depression years, when production was low, the power-demand charges absorbed all the operating profits. As a result, the company in March, 1936, installed a Buckeye 5-cyl. 187-hp., 400-r.p.m. Diesel engine which drives all the equipment on the dredge. According to C. C. Richards, superintendent, this engine is operated at capacity for a 10-hr. day at a cost of less than $10 for fuel and oil, while electric power under the same conditions and for the same period costs $50. He estimates that the savings will pay for this engine in less than two years under present business conditions.

Operating at full capacity, pumping 130 tons of sand and gravel per hr. 300 to 400 ft. against a vertical head of 25 ft., this engine uses 10 gal. of No. 2 distillate per hr. This fuel costs the company 7.7 c. per gal. delivered at the plant. In a 10-hr. day about 1 gal. of lubricating oil is used. Oil is changed only once in a season.

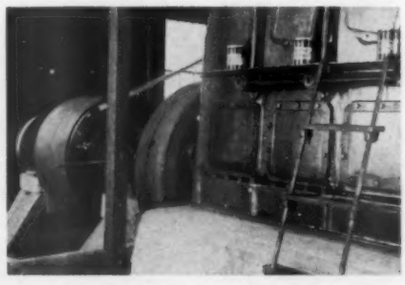
The dredge is equipped with a 40-ft. Diamond cutting ladder operated by a 3-drum Clyde hoist. The 10-in. Amsco dredge pump moves the material through the pipe-line to dewatering bins at the plant. The deposit is dredged to a depth of 35 ft. and the bank, 40 to 50 ft. above water-level, is caved in by dredging.

The arrangement of the drives from this engine is unusually compact, as can be seen in the accompanying photographs. Next the engine is the flywheel and then a metal-plate type of flexible coupling. Then in order are a Shafer self-alining roller bearing, a disk-type clutch, and a pulley which drives the dredge pump through a 24-in., 7-ply fabric belt. Another Shafer bearing supports the shaft at this point. Beyond this bearing is a pulley with a 10-in. belt driving a line-shaft and a small pulley which drives a small air-compressor used in starting the engine. As the engine and the two bearings are mounted on a monolithic concrete base it is evident that misalinement can not develop. In operation the engine is almost vibrationless. The line-shaft mentioned drives by belts the ladder, the hoist, a priming pump, a vacuum pump and a lighting-current generator.

This engine is totally inclosed with plates which can be easily removed to give access to the bearings, oil pumps and push rods and a hood which covers the intake and exhaust valves and oil lines. A feature of this engine is the "Silent Watchman," a simple mecha-



The 5-cyl. 187-hp. Diesel engine which operates all equipment aboard the dredge.



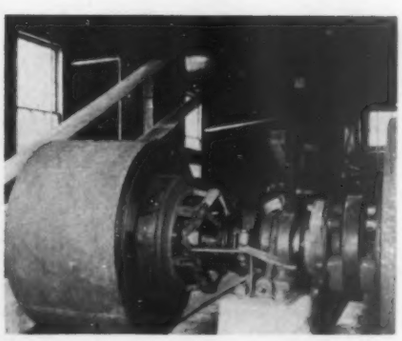
Engine and bearings are firmly supported on monolithic-concrete bases.

Another view of the Diesel engine, clutch and coupling.

nism which automatically stops the engine when the oil or water pressure drops, thus preventing damage. A weighted lever conveniently located on the engine is raised when the engine is started. The oil and water pressure then raise a plunger which enters a slot in the bottom of the lever, holding it erect. The oil and water lines have pressure valves set at 10 lb. and when either pressure falls below that figure the plunger drops, allowing the lever to fall and shut off the engine. The oil pressure is supplied by a rotary pump on the engine and the water pressure by a vertical pipe with an overflow at a height to give 10 lb. pressure. The oil overflows from the engine into a 30-gal. tank and is passed through a filter before going back to the engine. The engine starts from any cylinder by merely turning on the air and raising the lever of the "Silent Watchman."

The engine is equipped with all the necessary appurtenances to safeguard its operation. The instruments include an oil-pressure gage and an "Allnor" exhaust-temperature indicator which can be adjusted instantly to show the temperature for each cylinder. Each cylinder also has a U. S. Gauge Co. direct heat indicator which shows the cooling-water temperature at that point. For the best results efforts are made to maintain an exhaust temperature of about 700 deg. F. and a cooling water temperature of about 120 deg. F.

The monolithic concrete base supporting the engine and bearings rests on a bed of heavy timbers. Seven 12-in. by 12-in. timbers, each 60 ft. long, run lengthwise of the dredge hull and eight 12-in. by 12-in. timbers 24 ft. long run crosswise.



The drive shaft showing, from left to right, the pump pulley, clutch, bearing, flexible coupling, and a portion of the fly-wheel.

Eugene (from page 55)

bin feeding a 24-in. Symons disk crusher. The crushed gravel (1¼-in. minus) is taken by another belt-bucket elevator to another Link-Belt double-deck screen followed by a second Russell shaker screen. All sizes go direct to crushed-gravel storage.

The bins are in two sections separated by the building housing the crushers and elevators. They are of timber construction reinforced with tie-rods and have concrete floors and foundations. One section with seven bin compartments is used for storing sand and uncrushed gravel and has a total capacity of 500 cu. yd. The other bin for crushed gravel has the same capacity but has eight compartments. Trucks are loaded under the bins and cars are loaded through side chutes for shipment over the Southern Pacific Ry.

Looking down the main conveyor to the track unloading hopper.

which runs by the plant. During slack seasons excess materials are stock-piled and later reclaimed by two ⅜-cu. yd. "Little Giant" crawler cranes made by the Locomotive Crane Co. The delivery fleet owned and operated by the company includes four 4-cu. yd. Mack trucks, two 3-cu. yd. Autocar trucks and a 3-cu. yd. Dodge truck.

Drag scraper excavating material from gravel bar in the river.

The new equipment installed in rebuilding this plant included all belt-conveyors, both vibrating screens, both bucket-elevators and the sand drag. All this equipment was supplied by the Link-Belt Co.

By A. J. R. CURTIS
Asst. to General Manager
Portland Cement Assn.

A 5-Year Analysis of Accidents in the Portland-Cement Industry

AS activity increases and the cycle of business depression is left farther behind, the industry is faced with the problem of forcing downward the number and the severity of its plant accidents while its man-hours of work and its hazards increase. It is advisable to study the accidents of the past several years, so that we may know what to expect of the future and be prepared to check undesirable trends.

Frequency Rates.—In 1931 the member plants of the Portland Cement Assn. experienced 5.62 accidents per 1,000,000 man-hours worked. Then followed two years with comparatively good records —4.47 in 1932 and 4.54 in 1933. In 1934, however, the industry was aroused by a sudden increase in accidents, which in that year reached a peak of 7.13 per 1,000,000 man-hours exposure. The accident rate was reduced slightly in 1935 to 6.85 per million man-hours.

For the same 5-yr. period the accident-frequency rate per 1,000,000 bbl. of cement shipped shows nearly the same variation as the rate per 1,000,000 man-hours. After a reduction from 2.12 in 1931 to 2.03 in 1932 the rate rose to 2.52 in 1933, then in 1934 leaped to 3.85. This was followed by a slight decrease in 1935 to 3.65. This fact is mentioned particularly to establish the validity of some comparisons between 1935 and 1936 which will be made later.

Severity.—A somewhat similar situation over a 5-yr. period is found in the severity rates for the industry. In 1932, when the frequency rate was lowest, the severity rate was only 1.8 days lost per 1,000 man-hours worked. There was a slight increase in 1933 to 2.66 followed by a sharp rise in 1934 to 4.26 days lost per 1,000 man-hours worked. The accidents in 1934 were the most severe the cement industry had experienced since 1925. In 1935 the severity rate of 2.96, though somewhat lower than 1934, was still high when compared with the rate of 1.58 for all industries.

Departmental Analysis.—If the safety program is effective throughout the industry, it will generally be expected that

ACCIDENTS BY MONTHS

Month	1931	1932	1933	1934	1935	1936
January	7	13	8	16	6	15
February	16	5	10	11	17	14
March	15	9	7	21	13	20
April	29	12	8	14	19	29
May	23	10	15	21	18	32
June	12	17	11	17	23	33
July	25	12	17	40	17	30
August	22	15	8	26	27	26
September	19	10	7	21	17	.....
October	22	10	15	12	18	.....
November	13	9	12	17	26	.....
December	11	9	11	16	18	.....
Totals	214	131	129	232	219	.....

the percentage of accidents attributable to each department will be fairly constant over a period of time, regardless of the accident rate for the industry as a whole. This is generally true. Quarries in 1935 had 19.6 per cent. of the accidents; in 1934, 21.6 per cent. of the accidents; in 1933, 21.7 per cent. of the accidents; in 1932, 17.3 per cent. of the accidents. Note how close the accident percentage stays to the median of about 20 per cent. The same is true of other departments. Clearly, then, the safety program is effective, or ineffective, throughout all departments of the industry. No single department is unaffected by the accident-prevention campaign.

If, then, we wish to bring about a significant reduction in our accident rate, we ought to expend extra effort on those departments which have the largest number of accidents, even though those departments are not necessarily experiencing a greater frequency of accidents per man-hour exposure.

Comparison of relative safety efficiency between departments must take into consideration the exposure of the department.

For example, quarries in the industry experienced 19.6 per cent. of the accidents in 1935 and had 14 per cent. of the total man-hours. Thus they had more than their share of accidents as did also the burning, shop and yard departments. The shop department is apparently the most hazardous of all. Its share of the total number of accidents last year was 9.1 per cent., although its man-hours are only 4.5 per cent. of the total.

Monthly Records.—The recognition

COMPARATIVE ACCIDENT FREQUENCY

	Accidents	Frequency per 1,000,000 Man-Hours	Cement Shipped by Reporting Companies (*bbl.*)	Frequency per 1,000,000 Bbl.	Severity
1935	219	6.85	59,947,200	3.65	2.96
1934	232	7.13	60,733,600	3.81	4.26
1933	129	4.54	51,268,800	2.52	2.66
1932	131	4.47	64,463,200	2.03	1.80
1931	214	5.62	101,172,000	2.12	3.31

COMPARATIVE ANNUAL RATES

Month	1936			1935		
	Cement Shipped (*bbl.*)	Accidents	Accident Frequency Per 1,000,000 Bbl.	Cement Shipped (*bbl.*)	Accidents	Accident Frequency Per 1,000,000 Bbl.
January	3,111,200	15	4.82	2,262,000	6	2.65
February	2,524,800	14	5.54	2,360,800	19	8.05
March	5,710,400	20	3.50	3,902,400	15	3.84
April	7,233,200	29	4.01	4,942,400	20	4.04
May	8,896,800	32	3.60	5,942,400	20	3.37
June	9,933,600	33	3.32	6,105,600	24	3.93
July	9,412,800	30	3.19	6,250,400	22	3.50
August	.....	26	.....	6,480,000	26	4.01
September	.....	.....	.....	6,239,200	18	2.88
October	.....	.....	.....	7,035,200	20	2.84
November	.....	.....	.....	4,780,800	27	5.65
December	.....	.....	.....	3,611,200	23	6.37
1st 7 mos	46,822,800	173	3.69	31,764,000	126	3.97

RELATIVE SAFETY EFFICIENCY

Department	1935		1934		1933		1932		1931		5 Years	
	Accidents	Per Cent. of Total	Accidents	Per Cent. of Total	Accidents	Per Cent. of Total	Accidents	Per Cent. of Total	Accidents	Per Cent. of Total	Accidents	Per Cent. of Total
Quarry	43	19.6	50	21.6	28	21.7	31	23.7	37	17.3	189	20.4
Burning	24	11.0	25	10.8	18	14.0	16	12.2	32	15.0	115	12.4
Packing and Shipping	29	13.2	21	9.1	10	7.7	16	12.2	20	9.4	96	10.4
Shops	20	9.1	14	6.0	14	10.9	6	4.6	20	9.3	74	8.0
Yard	14	6.4	17	7.3	11	8.5	11	8.4	20	9.3	73	7.9
Raw	17	7.8	17	7.3	5	3.9	8	6.1	17	7.9	64	6.9
Power	15	6.8	11	4.7	6	4.6	13	9.9	9	4.2	54	5.9
Finish	15	6.8	15	6.5	5	3.9	5	3.8	10	4.7	50	5.4
Crushing	6	2.7	12	5.2	9	7.0	7	5.3	9	4.2	43	4.6
Coal Grinding	3	1.4	11	4.7	2	1.5	5	3.8	12	5.6	33	3.6
Railroad	8	3.7	3	1.3	6	4.6	1	0.8	6	2.8	24	2.6
Cement Storage	4	1.8	6	2.6	1	0.8	2	1.5	7	3.3	20	2.2
Clay Field	4	1.8	0	0	1	0.8	1	0.8	1	0.5	7	0.7
Coal Storage	1	0.5	0	0	0	0	0	0	0	0	1	0.1
Unclassified	16	7.3	30	12.9	13	10.1	9	6.9	14	6.5	82	8.9

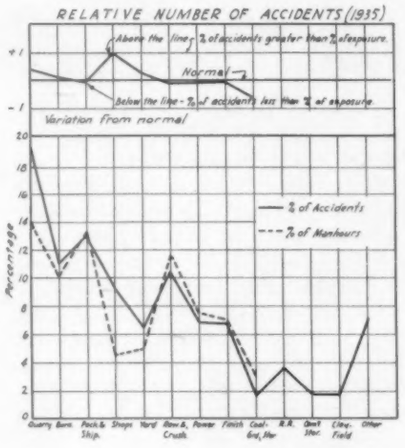
of particularly dangerous periods of the year is a valuable aid to the safety program. At present no comparison by rate per 1,000,000 man-hours is possible on a monthly basis; however, the rates per 1,000,000 bbl. for each month in 1935 and 1936 can be profitably studied. It will be noted that the month-to-month trends in 1935 and in 1936 are similar. Where the 1935 rate rose, the 1936 rate also rose, though not always to the same degree. In November and December, 1935, the industry experienced an unusually high frequency, exceeded only by February of the same year.

It is therefore evident that especial emphasis on safe practices is indicated for November and December, 1936, to avoid a similar rise. During the first seven months of 1936 the accident frequency has been appreciably lower than the rate for the same period in 1935. If in the next three months the number of accidents can be kept at a low level, 1936 should show a decided improvement over 1935.

Absenteeism.—In 1935 the first general absenteeism study for the industry was made. Thirty plants participated. It is impossible within present limits to do more than give a very brief summary of the results. Respiratory illnesses caused 55 per cent. of the total. This is certainly no worse than average—possibly better. A public-utility company, where the exposure to variable weather conditions is comparatively slight, has reported that 51 per cent. of its illness absenteeism is due to respiratory illness.

Injuries incurred outside the plant caused twice as many absences as occupational injuries, but each absentee lost only one-half as much time. There were 100 absences because of illness for every 2.97 absences due to occupational injuries and for every 5.96 absences due to non-occupational injuries.

For every 100 days lost on account of illness there were 21.65 days lost on account of occupational injuries and 8.71 days lost because of non-occupational

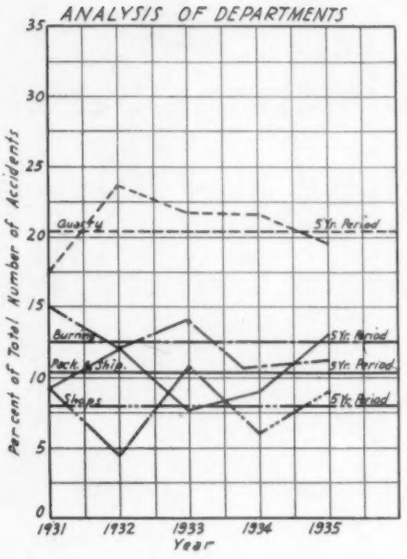


injuries. Note the high severity of occupational injuries.

Highway Safety.—In 1937 the association plans to extend its accident-prevention program into the field of highway safety, since this affects both the trucking and sales departments of its members. Report blanks will be available to all members desiring to participate in the study. These blanks, when properly filled out, will give a detailed description of the type of accident and its cause. The results will be tabulated in a form similar to the present tabulation of industrial accidents. The accident rate and summary of causes will be made available to members for distribution among their drivers.

This type of publicity is highly valuable educational material. It gives each driver an opportunity to learn what hazards, both subjective and objective, require alert attention on the road. As a further help in the reduction of drivers' accidents, the association plans to distribute check sheets which will serve as a practical and quite complete guide in searching for mechanical defects which might make a car unsafe.

Looking Ahead.—With increased activity and the consequent hiring of new men or rehiring of men whose skill has been lost through disuse, accidents have become more frequent. This increase in frequency is not altogether surprising and can be readily checked by alert



superintendents. In many plants it has already been reduced by intensive educational efforts. One plant which experienced 10 accidents in 1935 has, by intensive and repetitious drill on safe practices, reduced its accidents to two so far in 1936. Both of these accidents occurred prior to April 1.

The Portland Cement Assn. safety program for the next year will be more comprehensive than ever before. Further industrial campaigns will be conducted, and efforts will be made toward training employees in home and highway safety. With every mill and quarry organization coöperating, it is confidently expected that 1937 can be made a safer year than the industry has yet experienced.

Canada's Asbestos Output Reflects Building Gains

Revised figures of the Dominion Bureau of Statistics at Ottawa, Canada, show that the output of all grades of asbestos during the year 1935 totaled 210,467 short tons, valued at $7,054,614, compared with 155,980 tons, valued at $4,936,326 in 1934. Employment in Canadian asbestos mines and mills rose to 2,072 persons, who received $1,904,053 in salaries and wages from 1,855 employees and a pay-roll of $1,608,812 in 1934. Shipments in 1935 were the highest in quantity and value since 1930. Several of the larger mines operated continuously throughout the year, and mill extensions were reported by three companies. A good deal of stripping was done, and the recent application of block-caving methods in one of the larger mines has reduced mining costs, improved the grade of rock sent to the mill, and improved working conditions.

All the 1935 output came from Quebec.

Limestone Beneficiation, Stone Sand and Kyanite Discussed at State College Joint Meeting

MORE than 100 mining and ceramic engineers gathered at State College, Pa., September 24-26 at a joint meeting of the industrial-minerals division of the American Institute of Mining and Metallurgical Engineers, and the materials-and-equipment division of the American Ceramic Society. Much of the program was devoted to mining and beneficiating of ceramic raw materials, but several of the papers were directly concerned with stone and other non-ceramic products. The meeting was reported briefly in the October issue of PIT AND QUARRY. Following is a summary of some of the interesting papers presented:

S. M. Shallcross presented a paper on mining practice at the Bell limestone mine of the American Lime & Stone Co., Bellefonte, Pa. In 1921 the company operated 19 quarries and 72 shaft kilns spread over an area of 40 mi. between Bellefonte and Altoona. The producing capacity of the 72 kilns amounted to approximately 700 tons per day. At present the company operates 3 rotary kilns and 6 shaft kilns with a combined output of about 500 tons of lime per day, all at the Bellefonte plant. In addition the company also operates an open quarry for construction stone at Union Furnace, near Tyrone, Pa.

The dip of the limestone ledges is 52 deg. at surface but increases to 56 deg. at the 400-ft. level and a maximum of 80 deg. at the bottom of the shaft. The first method of mining was that of overhand-underhand stoping but since 1923 this method has given way to shrinkage stoping which has proved to be more economical and is also capable of greater output.

The safety record of the Bell mine has been outstanding, far superior to that of the former open quarries in the Bellefonte area.

Limestone Sand.—A. T. Goldbeck, of the National Crushed Stone Assn., discussed developments in the processing and marketing of limestone sand. He cautioned that limestone sand should not be confused with screenings, although it may be prepared from screenings by careful separation and washing to remove all dust. Drag classifiers are commonly used in preparing the material for market. In some operations two classifiers in series may be used to overcome the difficulty in removing fines. Air classifiers have the advantage of more accurate control. At present there are at least 19 producers of stone sand in Ohio, and production has been reported from 15 other states.

Harshness in concrete made with stone sand can be overcome through proper gradation of the fine aggregate, according to Mr. Goldbeck. Laboratory tests of concrete made with 17 different gradations of fine aggregate revealed that rich concrete such as that used in concrete pavements requires more of the larger sizes in the sand, whereas lean concrete will require more fines to offset the lower cement content thereby maintaining proper workability. Too many coarse particles seem to be bad from the standpoint of durability, but freezing-and-thawing tests in general gave as good results on samples made with stone sand as those with natural sand.

Among structures made with stone sand are the river bridge at Knoxville, the stadium at Ohio State University, the Big Bend Tunnel on the Chesapeake & Ohio R. R. in West Virginia, and others of lesser importance. The Bethlehem turnpike in Pennsylvania is paved with concrete made with limestone sand, and various highway departments are interested in the material and probably will build test roads in the near future.

Stone sand has also been found satisfactory in bituminous paving mixtures. General adoption of tentative specifications will aid the stone industry in preparing the material for market. Limestone and dolomite are the most important but granite, trap, and other kinds of stone sands have been used.

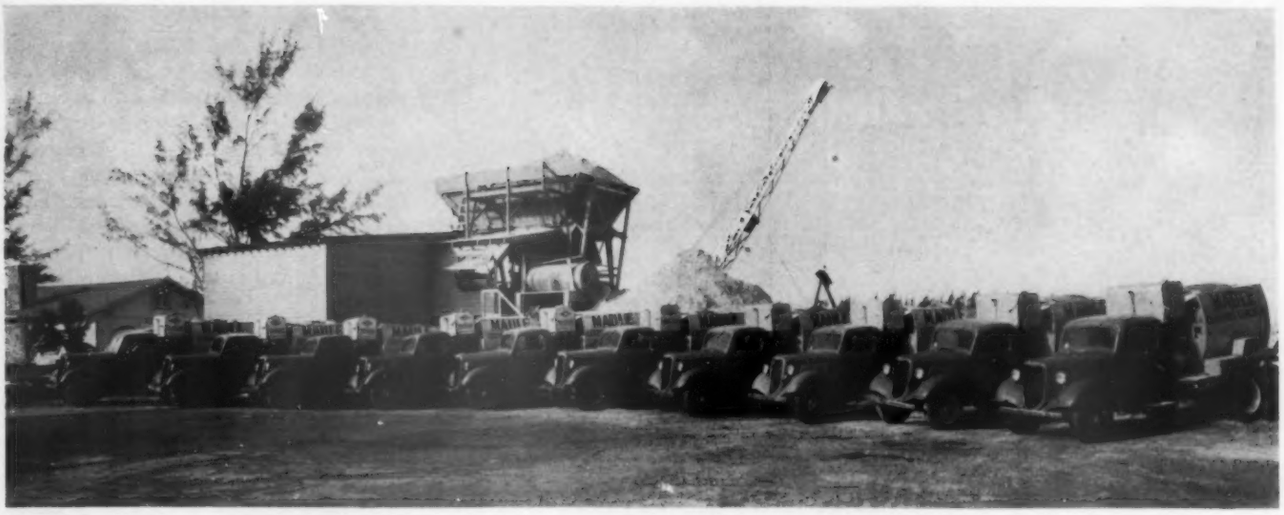
Limestone Beneficiation.—B. L. Miller reviewed the history of limestone flotation by the Valley Forge Cement Co. at West Conshohocken, Pa. He stated that a paper bringing developments up to date is expected to be published shortly. Meanwhile he reported that a cement plant in Argentina, one in South Africa, and one in Finland are being designed to use flotation to bring slurry to the proper composition. Three pilot plants are now experimenting with cement raw materials in France and there has been considerable interest among the cement manufacturers in this country regarding the wider use of the beneficiating process.

At Valley Forge considerable experimental work has been done to decrease the impurities in limestones. The alumina, silica, and iron content has been reduced from 18 per cent. in the original stone to less than 1 per cent. in the final product, and the calcium-magnesium carbonate has been brought up to more than 99 per cent.

In the ensuing discussion Major Englehart, in reply to an inquiry regarding costs, stated that the entire flotation operations at Valley Forge require only 60 hp. and that the reagent cost is quite low. Offsetting this the company has effected a saving of 10 per cent. in kiln fuel and 10 per cent. in grinding costs. Far more important, however, is the saving in quarry operations. The one shovel now used in the quarry loads everything regardless of chemical and mineralogical content. Previously, stone was taken from two or more locations in the quarry and blended to provide the proper raw material.

Kyanite.—R. W. Smith, state geologist of Georgia, reported considerable interest among ceramic engineers in the use of kyanite, particularly for refractories used in the manufacture of glass. The price for this type of kyanite (1 per cent. each or less of iron oxide and free silica) has been about $30 per ton. One producer, however, expects to lower his mining and milling costs and be able to sell kyanite at a much reduced price. Another manufacturer has produced experimentally a high-alumina refractory using 50 per cent. kyanite in the body. The high price of kyanite, however, has prevented commercial application.

Dr. Oliver Bowles of the U. S. Bureau of Mines is present chairman of the industrial-minerals division of A. I. M. E. This division was formed less than two years ago, and gives promise of bringing much of value to the technical literature of interest to producers of nonmetallic minerals.



Part of the truck-mixer fleet at the Miami batching plant of the Maule-Ojus Rock Co.

Miami Aggregates Producer Supplies Truck-Mixed Concrete to Builders

THE building boom which in 1935 placed Miami and Miami Beach, Fla., ahead of many larger communities in volume of building construction was responsible for a sharp increase in the facilities for the production and delivery of ready-mixed concrete in this area. During depression years the concrete used was easily furnished by one producer who has recently added materially to his equipment. Several other aggregate producers and dealers have also added equipment for the production of ready-mixed concrete. So far in 1936 the demand is ahead of that of 1935 and present indications are that this demand will continue unabated after the close of the 1936-7 winter season.

The Maule Ojus Rock Co., one of the pioneer aggregate producers in this district in 1935 added ready-mixed concrete to the complete list of materials which it supplies to the building industries. Concrete batching plants were erected successively at its material yard on Biscayne Bay in Miami Beach, at 11th Ave. and 62nd St. N. W., Miami, and at its aggregate plant and material yard at Ojus, Fla., about 15 mi. north of downtown Miami. Both the first-mentioned batching plants have been operated at capacity since that time because of their location near the two centers of building activity. The Ojus batching plant has had comparatively little business as yet but is strategically located to take care of future expansion which is greatest in this direction. In addition to regular construction this company also has a 10,000-cu. yd. contract for concrete used in the construction of a Federal Negro-housing project.

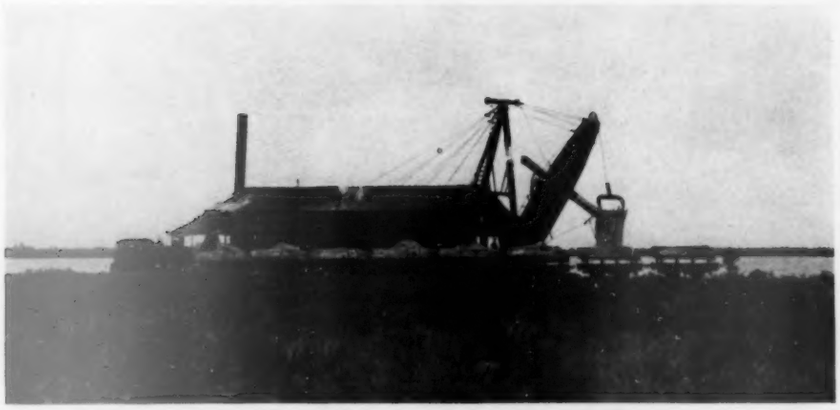
An indication of the business being done by this company is the rate at which additional equipment has been purchased. In September, 1935, 6 Blaw-Knox 1½-cu. yd. truck-mixers mounted on Ford V8 trucks were purchased. Two months later four similar units were added. Late in the Spring of 1936 three additional Blaw-Knox 2-cu. yd. truck-mixers were purchased. Recently 4 more 2-cu. yd. truck-mixers were added. The 1½-cu. yd. mixers are operated by Hercules gasoline engines and the 2-cu. yd. mixers have truck-engine drives.

Aggregates bin and batching equipment at the Miami Beach yard.

At the Miami Beach yard the company carries a complete line of building materials. There is also a steel-fabricating plant which shapes reinforcing steel for concrete construction and cages for concrete piling.

Aggregates are received by barge from Ojus *via* Biscayne Bay and are unloaded by a ¾-cu. yd. P & H gasoline crane into a 2-compartment Blaw-Knox batcher bin. A stock-pile is also maintained to make concrete production independent of any delays which might occur in the delivery of aggregates. Sand and gravel are weighed in a 2-compartment Blaw-Knox weighing batcher which is equipped with a Howe 3-beam scale. Water is measured in a tank at the plant and again in the tanks on the truck-mixers. Cement is loaded into the trucks from sacks.

The Miami batching plant went into operation in January, 1936, and since that time has delivered 90 to 150 cu. yd. of concrete daily to the Federal housing project previously mentioned in addition to caring for private construction demands. Here aggregates are received by truck from Ojus and facilities are



The 3-cu.-yd. dipper dredge excavating material and loading it into a train of cars.

available for concrete production only. A new Blaw-Knox bin and weighing batcher are used.

At Ojus is the aggregate plant, which is the backbone of the company's business. A 3-cu. yd. dipper dredge loads material into cars or barges depending on the type of material in demand. This dredge can load over 200 cu. yd. per hr. of pit-run material into barges. The plant can produce any desired sizes and has an hourly capacity of 30 cu. yd. of sand and 45 cu. yd. of concrete aggregate or the same amount of sand and 90 cu. yd. of ballast. A large part of the aggregate is used by the company in the manufacture of concrete or concrete products.

The company's concrete-products facilities at Ojus are probably the most extensive in the South. Eleven separate plants are operated for the production of concrete blocks, bricks, partition tiles and drain tiles. Cement roof tiles are also made in a wide variety of colors. In a 10-hr. day the production of these plants totals 10,080 bricks, 2,500 partition tiles, and 18,900 blocks.

Since the last hurricane building specifications have been tightened considerably. Concrete blocks must test over 800 lb. per sq. in.; those made by this company average about 1,200 lb. All products, including concrete and concrete products, are inspected by the Nutting Laboratories to insure their meeting specifications.

Another plant on the property produces 150 cu. yd. of bituminized ag-

Crane and the batching plant at the company's yard in Miami Beach.

gregates daily. At Ojus the company also has a complete new foundry, which is equipped with an iron cupola, brass furnace, etc. A modern filling station and a lunch-room are also operated by the company at this location fronting on U. S. Highway No. 1, the main road from Miami to the north.

The control of the proportioning of the materials and of the quality of the finished concrete is supervised by an engineering company.

One of the truck mixers being charged with cement, water and aggregates.

Dry Ice *(from page 50)*

the gas is first compressed to 75 lb. pressure and is ammonia-cooled. It is then further compressed to 400 lb. pressure and is ammonia-cooled to a temperature of —30 deg. F., at which point it becomes a liquid. The liquid CO_2 is then allowed to expand into a Southwark CO_2 snow press, where it is made into 10-in. cubes under a pressure of 2,000 lb. per sq. in. The carbon-dioxide cubes are then wrapped, weighed on a Toledo dial scale and put into insulated shipping boxes for delivery in specially-designed light trucks. There are also provisions for the storage of this refrigerant.

It is estimated that only about 10 per cent. of the carbon dioxide from the

Lime being discharged from four feeders under kiln to apron conveyor.

Truck being loaded with quicklime with spout from storage tank.

kiln is lost in the ice-manufacturing process.

The lime plant was designed by the Gillette Research Corp. in collaboration with the owners and the Jeffrey Mfg. Co., which supplied the stone- and lime-handling equipment. The equipment in the solid carbon-dioxide plant was supplied by the York Ice Machinery Corp., which collaborated with the Gillette Research Corp. in its design.

Gypsum Output Rises in First Half of 1936

Stimulated by increased building activity, production and sales of gypsum and gypsum products in the second quarter of 1936 showed large increases over the corresponding period of 1935, according to returns of the quarterly canvass of the gypsum industry by the U. S. Bureau of Mines.

Output of crude gypsum and gypsite in the second quarter of 1936 totaled 727,729 short tons, compared with 523,238 tons in the second quarter of 1935, an increase of 39.1 per cent. Imports as reported by importing firms increased at a slightly greater rate than domestic production, or 42.2 per cent. Sales of raw or uncalcined gypsum or gypsite of domestic and foreign origin were 17.4 per cent. greater than in the 1935 period—221,330 tons, compared with

188,458 tons. The amount of calcined gypsum produced from domestic and imported rock showed an increase of 44.0 per cent. over the second quarter of 1935,—559,247 tons in the second quarter of 1936, compared with 388,440 tons in the corresponding period in 1935. Sales of calcined gypsum for manufacturing uses increased 37.0 per cent. in the second quarter of 1936 compared with the same period of 1935.

More detailed figures for plaster sales in the second quarter of 1936 were as follows: Base-coat plasters (exclusive of sanded plaster), 301,140 tons; sanded plaster, 25,021 tons; and gaging, molding and finishing plasters, 42,477 tons. Total sales of these three groups in the second quarter of 1936 amounted to 368,638 tons, compared with 272,202 tons in the corresponding 1935 period, an increase of 35.4 per cent.

Sales of gypsum lath and Keene's cement more than doubled compared with the second quarter of 1935. Sales of wall board and partition tile were 96,021,980 square feet and 3,959,293 square feet, increases of 29.8 per cent. and 79 per cent., respectively.

Statistics covering the first half of 1936 likewise show heavy increases over figures for the first six months of 1935, the percentages of gain ranging from 15.1 per cent. for sales of uncalcined gypsum to 101.5 per cent. for gypsum lath. Crude gypsum mined during the 1936 period rose to 1,083,604 tons, an increase of 32.9 per cent.; calcined plasters were up 31 per cent.; and partition tile increased 47.9 per cent.

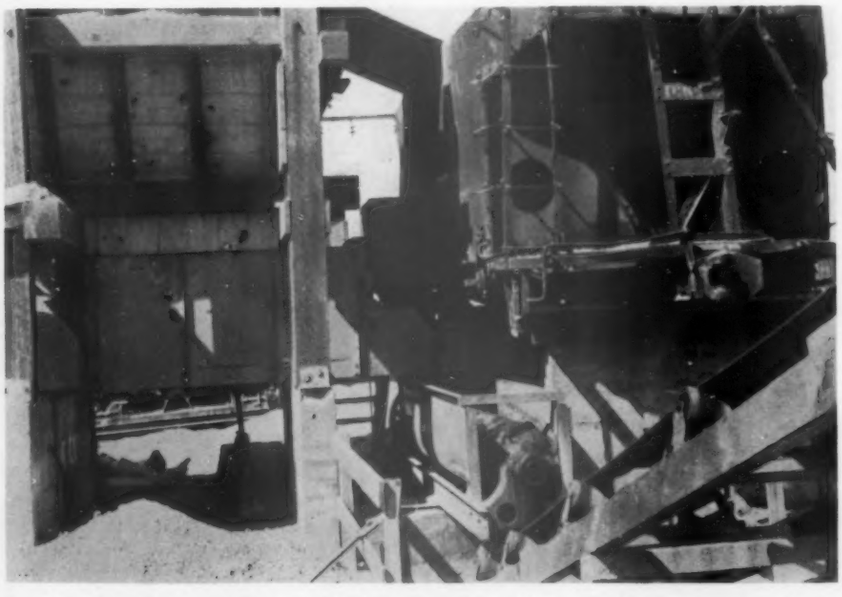
Loading stabilized mix to truck for delivery to the road at the American Aggregates Corp. mixing plant.

American Aggregates Corp. Now Producing Stabilized Material

To meet the rapidly-developing local market for stabilized road mixtures the American Aggregates Corp. has recently joined the group of plants now producing them in the Detroit area. In August of this year it received its initial contract to supply stabilized soil-aggregate mixture for a 10-mi. highway project in Oakland County, Mich. Two weeks later the mixing plant had been installed and was in operation, producing 400 to 500 tons of material per

The stabilized mix set-up, located at the company's Green Oak, Mich., plant, consists essentially of a clay feeder and a pugging mill, with suitable conveyors for introducing the aggregate and delivering the finished mix to the truck-loading bin.

Before entering this field of activity some prospecting was done on the company's land to locate a source of suitable clay. It was found that a sand-clay mixture, containing an excellent clay, could be obtained by stripping the overburden from one of the gravel deposits. This sand-clay mixture, together with an equal amount of pea and birdseye gravel, combines to make a finished mixture in accordance with stabilization specifications. The finished mixture has a plasticity index of from 10 to 11.



Clay hopper, feeder and calcium-chloride hopper. In the foreground is the pug-mill and belt-conveyor.

The sand-clay is stripped from the deposit with a dragline, and a vibrating screen is used to remove any oversize stone before the material is carried to the stabilization plant. There the sand-clay is stock-piled adjacent to the gravel pile, and a crane is used to transfer the materials alternately to the feeding bins. The sand-clay feed is controlled through a screw-type feeder to the pug-mill, while the gravel is chuted directly from the hopper into the mill. A calcium-chloride hopper, located directly over the pug-mill, feeds the chemical into the mill at the prescribed rate of 12 lb. per cu.yd. of material. A spring-steel rod, extending from the top to the bottom of the calcium-chloride hopper, is connected with the pug-mill shaft. The revolutions of the shaft move the rod up and down, thus agitating the calcium chloride and causing it to flow smoothly through the feeder plate. Since the finished mix should contain from 6 to 10 per cent. moisture by weight, the necessary water is added in the pug-mill.

A 12-ft. pug-mill gives the materials a thorough mixing and deposits the finished mixture on a belt-conveyor which elevates it to the 60-ton loading bin. Here the mixture is delivered into trucks and hauled to the road. The units are independently powered with electric motors.

In addition to the Oakland County contract, the plant has furnished stabilized soil-aggregate mixture to the Livingston County Road Commission for use in building up the shoulders on trunk-line concrete highways. The stabilized material is proving very satisfactory for this purpose.

The blast-sand plant as seen from the gravel-plant bin. The drier, elevator, screen and loading bin are shown.

Blast-Sand Market Provides an Outlet for Material Once Wasted

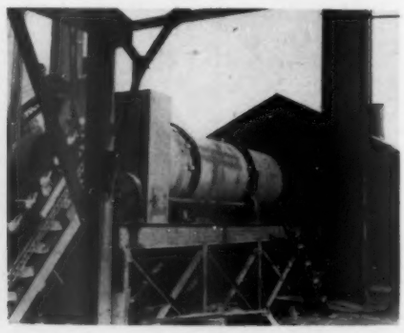
LIKE many other producers, the Koenig Coal & Supply Co. has over a period of years accumulated large quantities of waste sand at its Plant B at Oxford, Mich. This sand, while perfectly sound, is of a size for which there is ordinarily little demand. In November, 1935, however, the company installed a complete Hetherington & Berner drying and screening plant for the production of blast sand for sale in the Detroit area. This plant has a daily capacity of 80 to 100 tons of material which must all pass a No. 6 screen and be retained on a No. 12 screen and must contain less than 0.3 per cent. of foreign matter. According to company officials, business has been so good that considerable inroads have been made on the waste piles and these will be further depleted during the winter, when the gravel plant is shut down.

The deposit at this location contains about 60 per cent. sand, which accounts for the large amount of material formerly wasted. This sand-and-gravel plant, built in 1928, has a capacity of 300 tons per hr. Sized aggregates are loaded out from storage by means of a tunnel belt-conveyor which is inclined to discharge into a two-compartment car-loading bin. A stationary plow on this conveyor can divert the desired sand to a 50-ton Hetherington & Berner steel bin at the blast-sand plant. This bin discharges into a 20-ton steel hopper. When waste sand is being reclaimed it is dumped from trucks into a small hopper from which a portable belt-conveyor feeds it to the same 20-ton hopper. This arrangement makes the blast-sand plant independent of the other operations.

Sand is discharged from the 20-ton hopper by a triple reciprocating feeder into a single-strand chain-bucket elevator, which discharges it into the Hetherington & Berner direct-heat rotary drier. This drier has a capacity of 30 tons per hr. and is fired with oil which is stored in an 8,000-gal. tank. The drier is equipped with a Brown temperature indicator, and steam for heating the fuel oil is provided by a small vertical boiler.

The dried sand is taken by a steel-inclosed chain-bucket elevator to a 4-ft. by 8-ft. Simplicity double-deck vibrating screen which is fitted with No. 6 and No. 12 wire cloth. The material retained on the lower deck is blast sand and is chuted to one of two 1-car capacity steel carloading bin compartments. The material retained on the top deck and passing through the bottom deck of this screen is waste and is discharged to the other bin compartments from which it is loaded into trucks for disposal. The waste amounts to about 16 per cent. of the material handled.

Feed-bin chute and conveyor from truck-hopper discharge into the drier feed hopper.



The rotary drier which removes moisture from the blast sand. Feed elevator at left.

Personal Mention

G. G. TREAT, formerly secretary-treasurer of the Bessemer Limestone & Cement Co., Youngstown, O., will head the administrative staff of the company in the future under the title of vice-president and treasurer. No immediate appointment will be made to the office of president to succeed the late Charles Schmutz. Other changes include the elevation of J. Q. ADAMS to secretary and assistant treasurer. MATT J. CHAPMAN is now purchasing agent, succeeding Mr. Adams.

C. L. CURTIS is manager of the recently-formed Watertown Coal, Sand & Gravel Co., Watertown, Wis.

ROBERT DETTON has contracted to supply the gypsum requirements of the Idaho Portland Cement Co., Inkom, Ida., producing the material from deposits which he controls near Leadore, Ida.

WILLIAM J. REARDON, of the Reardon Cement Co., Cincinnati and Chicago, has been appointed by the Cincinnati Chamber of Commerce as a delegate to the deliberations of the Ohio Valley Improvement Assn. at Huntington, W. Va., on Nov. 10 concerning matters of navigation and the pollution of the waters of the Ohio Valley.

J. F. MITCHELL-ROBERTS, export manager for Oliver United Filters, Inc., has just returned from a six-months' tour of the Far East where he visited many plants using Oliver United filters in the Philippines, Japan, Manchukuo and China. Of particular interest were the American disk filters used for filtering slurry in a number of the cement plants. Mr. Roberts reports favorable progress in these countries in adopting modern methods of production and in making use of American-made equipment and American ideas.

W. C. STRAUB, formerly manager of the New York branch office, of the Chicago Pneumatic Tool Co., has been appointed assistant to the executive vice-president. He has been succeeded in his former position by A. D. STEM.

W. L. KEADY has been made vice-president in charge of sales by the United States Gypsum Co., Chicago, Ill. He succeeds the late Chas. F. Henning. Mr. Keady was formerly vice-president in charge of operations. L. H. ATKINSON, former assistant to the vice-president, has been named general sales manager and M. H. BASQUIN has been appointed manager of general operations.

D. F. TADLOCK of Fort Madison, Ia., has purchased limestone deposits near Denmark, Ia., and has started quarrying and crushing operations.

A. A. HOFFMAN, mining engineer, of San Francisco, has been appointed California manager of the American Potash & Chemical Corporation, with headquarters at Trona, Cal.

GEORGE H. BUCHER has been elected executive vice-president of the Westinghouse Electric & Manufacturing Co., with headquarters, at Pittsburgh, Pa. Mr. Bucher is also president and general manager of the Westinghouse Electric International Co. He has been connected with the Westinghouse organization since 1909.

E. B. JOHNSON has been made director of the newly-created department specializing in architectural and engineering service by the United States Gypsum Co. He formerly was manager of the company's contracting division.

WILLIAM E. CARSON, president of the Riverton Lime & Stone Co., Inc., Riverton, Va., and former chairman of the State Commission on Conservation and Development, has been elected a fellow of the British Scientific and Industrial Research Society. The fellowship was awarded in recognition of valuable research work in ceramics, and more specifically in the field of lime, lime products and other cementitious materials. Mr. Carson spent the past summer in Europe, visiting the important lime and cement plants in England, Germany, France and Switzerland and making a study of recent developments in those countries in the manufacture of hydraulic lime and natural cements.

H. W. HARMAN, for many years head of the engineering and research departments of the Stearns Magnetic Mfg. Co., Milwaukee, Wis., has been transferred to the sales department in the capacity of sales engineer with supervision of the purchasing department.

ROY A. KROPP has been named president of the Kropp Forge Co., succeeding Charles A. Kropp, who is now chairman of the board.

C. J. FECHHEIMER has joined the engineering staff of the Louis Allis Co., Milwaukee, Wis., maker of electric motors.

JOHN C. RILEY, JR., has resigned as manager of the North American Clay Co., Langley, S. C., and is now connected with the Standard Lime & Stone Co. as assistant superintendent at Martinsburg, W. Va.

GEORGE K. SMITH, of Albany, N. Y., widely known in road-building, construction and aggregates industry in New York state, died suddenly of a heart attack Sept. 30 in the offices of the Lehigh Portland Cement Co., New York, N. Y., where he had gone with his partners, C. W. Maxwell, president, and Richard Hopkins, vice-president, Albany Gravel Co. and the Ready Mix & Supply Corp., to attend a world-series baseball game. Mr. Smith was born in Marathon, N. Y., and spent his early years in the road-machinery business. In 1922 he assisted in forming the Albany Gravel Co., and several years later the ready-mixed-concrete firm.

CHARLES F. HENNING, vice-president of the United States Gypsum Co., Chicago, Ill., died recently of injuries suffered in an automobile accident. He was 55 years old. He had been connected with the company in various capacities since 1908.

MARSHALL E. STEPHENSON, 47, chief electrician at the plant of the Monarch Cement Co. at Humboldt, Kan., suffered burns and electric shock which caused his death recently when he came in contact with a high-tension wire at the plant. He had been continuously employed by the company since 1919.

FRANK P. LEONARD, 63, vice-president and general manager of the Leonard Gravel Co., Lansing, Mich., was fatally injured Oct. 1 when a truck driven by his son Howard C. Leonard backed into him, crushing him against a pile of material.

EDWARD C. DURINGER, for a number of years connected with the export department of the United States Gypsum Co., New York, N. Y., died Oct. 11 at Henrotin hospital, Chicago, Ill., after an extended illness.

J. R. PAUL, district sales manager of the Alpha Portland Cement Co., Ironton, O., died Oct. 8.

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Activated Bleaching Clays Restrict Market for Fullers' Earth

Fullers' earth has gained new commercial outlets that surpass in importance the original use, that of freeing woolen fabrics from oil and grease resulting from manufacturing, a procedure which is no longer used. Fullers' earth is now employed almost exclusively for the bleaching of oils and fats, large tonnages being consumed in the refining of petroleum products.

Until 1891 Great Britain was the only producer of fullers' earth. The discovery of the material, first in Arkansas and in more important quantities two years later in Florida, changed the course of international trade in fullers' earth. Whereas the British product continues to be used for bleaching edible oils and the United States still imports it for that purpose, the Florida earth is virtually the only kind used for refining mineral oils in all petroleum countries of the world.

Since 1934 a new development has complicated the fullers' earth market. The advent of activated bleaching clays has added to the stock of oil-bleaching media and has restricted the market for fullers' earth. These clays—bentonite and montmorillonite—occur in California, Nevada, and Utah. They are activated by treatment with sulphuric acid, whereupon they acquire properties similar to natural fullers' earth.

Before the World War Germany imported thousands of tons of both American and British fullers' earth, although deposits of fullers' earth were long known in Germany. However, the domestic product was of inferior quality and its industry lagged until the World War, when consequent to Germany's isolation its output was rapidly increased and technical improvements were spurred on. Valuable experience was accumulated in the treatment and utilization of activated bleaching clays. After the war deposits of high-grade bleaching clay were discovered in Bavaria, yielding clays of quality of the best hitherto found in Germany and equaling the best natural fullers' earth. The Bavarian clays require activation with acid for effective treatment of oils. These clays are mined from open pits or shafts in considerable quantities. Acid treatment dissolves alumina, iron, calcium, and magnesium and makes the clay porous, thus increasing the active surface. The clay is dried and ground after the minerals brought into solution are washed out by a difficult and prolonged treatment. Activated clay is used mainly in bleaching mineral oils and industrial greases.

According to the U. S. Bureau of Mines, the average price of activated clay to domestic consumers is 18 marks per 100 kilograms compared with 7 marks for fullers' earth. However, the quantity required for a certain bleaching effect is much less for activated clay. For example, it is said that 2 to 3 per cent. of Bavarian activated clay is required to bleach soy-bean oil compared with 10 to 15 per cent. of fullers' earth. The apparent cost difference, however, is offset by the loss of oil retained in the clay. Although activated clay retains its own weight of oil and natural fullers' earth absorbs only half its own weight, the former retains a smaller quantity of oil because so much less is used. For example, 100 kilograms of oil may be bleached with two kilograms of activated clay retaining two kilograms of oil compared with 10 kilograms of fullers' earth retaining 5 kilograms of oil. It is true that the oil absorbed by the bleaching clay or earth may be recovered by treatment with solvents or other methods, but its value is never the same as that of fresh refined oil and the cost of extraction is high.

In any case the price advantage remains in favor of fullers' earth. Thus, in the foregoing example, two kilograms of activated clay cost 0.36 mark and 10 kilograms of fullers' earth 0.70 mark, consequently, to be as economical as activated clay, fullers' earth would have to sell at 4.60 marks per 100 kilograms instead of the present price of 7 marks.

Traffic News Digest

Recent I. C. C. Decisions

Lime—In response to Fourth-Section application No. 16,319 the carriers, defendants in Gager Lime Mfg. Co. *v.* Alton, 244 I. C. C. 606 and carriers, parties to Pope's I. C. C. No. 12, have been granted authority to establish rates on lime from the Knoxville river-front extension, Sherwood and South Knoxville Extension, Tenn., to destinations in Illinois, Indiana, Ohio and West Virginia, without observing the long- and short-haul clause of Section Four. This order permits the carriers to establish the lowest rate that may be constructed via any route between the same points on the basis outlined in the application and to maintain higher rates from, to and between intermediate points subject to the usual circuity limitations and to the condition that none of the rates shall exceed those prescribed in the above case. This order supercedes the temporary relief authorized in Fourth Section order No. 12,241. I. C. C. FSO No. 12,514 Lime from Tennessee.

Upon reconsideration, the Commission has amended the report in 214 I. C. C. 606 prescribing rates on lime from Sherwood and Knoxville, Tenn., to destinations in Ohio, Indiana, Illinois and West Virginia. New rates for the future which are to become effective January 28, 1937 are based on a mileage scale beginning with a rate of $3.30 for 280 mi. and ending with a rate of $5.00 for 650 mi. applying on a carload minimum weight of 30,000 lb. To alternate with these rates the Commission has prescribed a basis of 80 per cent of this scale to apply on a c.l. minimum weight of 50,000 lb. This dual minimum has been the general practice of the Commission in rates which they have prescribed on lime during the past few years. The order reopening the case for reconsideration was issued at the same time the amended report and order were issued. I. C. C. Docket No. 26,829, Gager Lime Mfg. Co. *v.* Alton *et al* and No. 26,845, Williams Lime Mfg. Co. *v.* Southern *et al.*

Plaster—In response to Fourth-Section application No. 14,847 and numerous other Fouth-Section applications dealing with plaster, plasterboard and related articles, the Commission has authorized carriers operating east of the Rocky Mountains to continue or to establish and maintain over existing lines or routes from and to all points in the territory east of the Rocky Mountains on the plaster and plaster-board articles listed in an appendix to the report in straight or mixed carloads except on plaster board in straight carloads in southern territory, the lowest rates that might be constructed ever any line or route from and to all points in the territory considered and to continue or to establish and maintain higher rates from, to and between intermediate points provided that the rates from, to and between such higher rated intermediate points should not exceed rates constructed on the basis described in the report or the lowest combination rates subject to the Act and provided further that the relief should be limited to the usual 33⅓, and 50 and 70 per cent circuity rules. In measuring the degrees of circuity the distance over circuitous lines or routes might be determined by the same method that was employed in determining the rate-making distances and using the distances over the short lines or routes thus determined as the basis for computing the circuity. Applicants were also authorized to publish in lieu of specific routing a general rule or rules showing rates and maximum distances for routing similar to the rule approved in Western Cement Rates 132 I. C. C. 273. A further finding was to the effect that the rates constructed on the basis outlined in the report would be reasonably compensatory and that the use of the route in question would not result in wasteful transportation. I. C. C. FSO No. 12,510, plaster, plaster-board and related articles east of the Rocky Mountains.

Sand and Gravel—The Commission has found that the proposed reduction in rates on sand and gravel from Cayuga, Ind. to destinations in central Illinois is justified in so far as they apply on so-called traffic bound gravel but not on sand or gravel that is suitable for concrete construction. The suspending schedules applying on sand and gravel suitable for concrete construction are ordered to be cancelled but without prejudice to the filing of new schedules applying on these commodities after cooperative action of the interestd parties who appeared in the proceeding. I. C. C. Docket I & S No. 4,233 Sand and Gravel from Indiana to Illinois.

Pick-up and Delivery Service—Suspended schedules of eastern carriers proposing to establish free pick-up and delivery service have been approved in so far as they apply to traffic on which the rate is 45c. per 100 lb. or higher.

Examiners' Reports

Building Material—In a report and recommended order from joint Board No. 45 composed of A. F. Harvey of Oregon and W. D. Lane of Washington, the Board proposes that a permit be issued to R. A. Shope to operate as a contract carrier of building materials from Vancouver, Wash., to Portland, Ore. Two railroads and the Pacific Northwest Motor Rate Coördinating Bureau intervened to protest the granting of this certificate. I. C. C. Docket No. BMC50036.

Sand—Examiner Burton Fuller in a proposed report dealing with a large number of industrial-sand cases recommended that the Commission find the rates reasonable in some cases and unreasonable in others. So many cases and industrial rates were involved that it is not practical to reproduce them all here. Broadly speaking, his recommendations follow closely the basis of rates prescribed in Industrial-Sand Cases, 1930, reported in 188 I. C. C. 99. Most of these cases dealt with applications for reparation on shipments which had moved. In two cases, No. 27,348 and 27,398 dealing with rates for the future, the Examiner said "In No. 27,348, the Commission should find that the rates assailed to destinations in Illinois and Missouri are, and for the future will be, unreasonable to the extent that they exceed or may exceed the rates set forth in Column B of Appendix II (not herein reproduced, recommending point to point rates) and that the rates assailed to the other destinations are not unreasonable, and that any undue prejudice that may exist will be removed by compliance with these findings and with the above quoted admonition in Industrial-Sand Cases.

In No. 27,398, the Commission should find that the single-line rates assailed for distances of 200 mi. and less are, and for the future will be, unreasonable to the extent that they exceed or may exceed rates made under the so-called West Penn scale based on the single-line distances.

In the other complaints, the Commission

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should find that the rates assailed from Juniata to Kendallville in connection with the Pere Marquette and New York Central, from Mechanicsville to Kendallville, from Phalanx, in box cars, to Oil City and Coraopolis, and from points in New Jersey to the plant of intervener, William G. Scarlett, at Baltimore, were not unreasonable, and that the other rates assailed were unreasonable to the extent that they exceeded those set forth as prescribed in Appendix I. (Not herein reproduced, showing specific amounts of reparation.) The Commission should further find that the respective complaints received the shipments as described and paid and bore the charges thereon and are entitled to reparation in the amounts set forth in said Appendix I. "I. C. C. Docket No. 27,268, A. P. Smith Mfg. Co. *v.* D. L. & W. *et al,* No. 27,348, Producers' Core Sand Corp. *v.* M C. *et al,* No. 27,398, Industrial Silica Corp. *v.* Erie *et al* and related industrial-sand cases.

Sand and Gravel—Examiner T. Naftalin proposes that the Commission deny a certificate of public convenience and necessity on the application of Stephen J. Caffery as a common carrier by dump truck of sand, gravel and coal between Hancock, N. Y. and destinations in Pennsylvania within a radius of 50 mi. I. C. C. Docket No. BMC50.131.

New Complaints Filed

Gravel—Reparation is sought on an allegation of Section I violation in connection with the rate on gravel from Riverton, Ind., to Bethel, Ill., in a complaint filed by John E. Hollett, Attorney, 200 Indiana Trust Bldg., Indianapolis, Ind., in I. C. C. Docket No. 27,551, Merom Gravel Co., Indianapolis, Ind., *v.* Illinois Central.

Sand—Alleging violation of Section I on the rates on silica sand from Ottawa, Ill., to Cleveland, O., *v.* C. R. I. & P. *et al.*
plaint filed by E. R. Freeman, Practitioner, 7609 Platt Ave., Cleveland, O., in I. C. C. Docket No. 27,546, Perfection Stove Co., Cleveland, O., *v.* C. R. I. & P. *etal.*

Alleging unreasonable rates on sand from Schuyler Junction, Cedar Bluff, Cramer's Bridge and West Albany, N. Y., and Clayville and Dorchester, N. J., to Plainville, Conn., and Westfield, Mass., on shipments moving between November 23, 1932, and June 30, 1935, reparation is prayed for in a complaint filed by Leo Tessler, Practitioner, 1148 Manor Ave., New York, N. Y., in I. C. C. Docket No. 27,554, Plainville Casting Co., Plainville, Conn., *v.* B. & A. *et al.*

Reparation is sought in an allegation of violation of Section I in sand rates from Cedar Lake and Manumuskin, N. J., to Elmira, N.Y., in a complaint filed by L. V. Brandt and Edgar O. Anderson, Practitioners, 328 S. Jefferson St., Chicago, Ill., in I. C. C. Docket No. 27,568, Chemung Foundry Corp., Elmira, N. Y., *v.* C. of N. J.

Alleging violation of Section I reparation is sought on the movement of industrial sand and gravel from Cape May Point and Cape May, N. J., to Rumford, Me., in a complaint filed by J. H. Sturtevant, Attorney, 101 Milk St., Boston, Mass., in I. C. C. Docket No. 27,541, Oxford Paper Co., Portland, Me., *v.* Maine Central *et al.*

Traffic News

Emergency Charge Extension—On October 22 the attorneys for Class I railroads filed a petition asking the Commission for authority to file tariffs which will give effect to a plan of the carriers for retaining a substantial part of the revenue now coming from the emergency charges authorized in Ex Parte No. 115 which will expire on December 31. The principle problem in the way of filing these tariffs is outstanding orders of the Commission numbering close to 1000 in which it is stated that the orders will be in effect until further change by the Commission. The relief which the carriers are now seeking will merely enable them to publish and file the tariffs but that does not mean that the rates published and filed will become effective for they are always subject to protest and suspension. In asking for relief in this petition it is pointed out that during the first eight months of 1936 the net income of the petitioners was approximately $16,400,000. During the same period the emergency charges produced a revenue for these petitioners of $77,000,000. Petitioners contend that without the emergency charges the Class I railroads would have failed to earn by approximately $60,600,000 their fixed charges for the first eight months of 1936. This plan of the carriers also proposes certain changes in the consolidated classifications which would tend to make the ratings uniform in the official southern and western classification territories by reducing the rating in most cases to the lowest rating now applying to any territory. This would result in more than 1800 reductions in ratings and less than 40 increases. No increases are to be made in most of the class rates except the fifth and sixth. It is proposed to change the fifth class from 35 per cent. to 37½ per cent. of first class. The sixth-class rate is to be revised from 27 to 30 per cent. of the first-class rates. Present commodity descriptions are not to be changed and the increases provided on the predominant articles in the item will allow the increase for the entire item. At the present time truck or water competitive commodity rates are not subject to emergency charges and as a rule these rates will not be increased under this petition. Specific commodity rates which will be increased are given in Exhibit II which is a printed document of 77 pages and include among others an increase of 1 c. per 100 lb. on plaster and related articles. A 1 c. increase is also proposed on all kinds of lime. On crushed, ground or pulverized stone, agricultural limestone, slag, sand, gravel, chert and related articles an increase of 5 c. per ton is proposed where the present rate is from 60 c. to $1.00 per ton. Where the present rate is more than $1.00 per ton it is proposed to add an additional 10 c. per ton. In no case are the rates to destinations in the Chicago switching district to be increased on aggregates. In official territory where some of these aggregates move on 60 per cent. of sixth-class rate it is proposed to change these items to a rating of 16½ per cent. of the first-class rate. In receiving this petition the Commission has issued an order that the petition to be filed as Ex Parte No. 118 and that a copy of the petition be filed as a matter of record in each of the almost 1,000 cases enumerated in Exhibit III to the petition. In this order the Commission states that any of the parties to the several proceedings under the docket numbers and entitled as shown in Exhibit III attached to such petition, or in any other outstanding and effective order of the Commission, and any other persons interested in the subject matter thereof, be and they are hereby permitted on or before November 7, 1936, to file and serve a reply thereto, or to any particular portion of such petition, either to the petition generally or specially in respect to any of the particular proceedings shown in Exhibit III or an outstanding order in any other proceeding. Such replies should be in the form provided by Rule XXI of the Rules of Practice of the Commission, and should show service thereof upon petitioners by delivering in person or by mailing, one copy to R. V. Fletcher, Attorney, Transportation Bldg., Washington, D. C., and 25 copies should be supplied for the use of the Commission. At the close of business November 7, 1936, the matter will be considered submitted upon the petition and such written replies as shall then have been filed, without oral argument.

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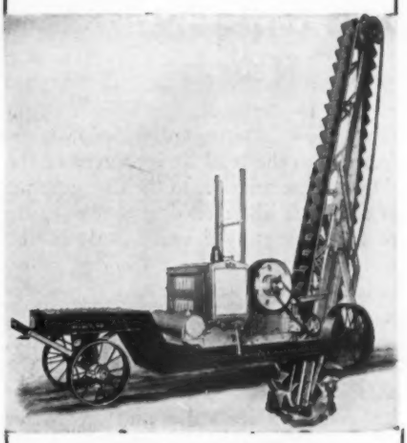
EQUIPMENT



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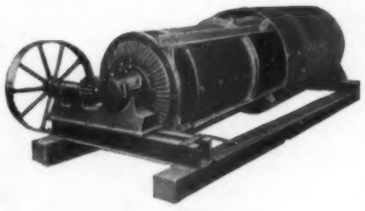

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Foreign Developments

Liberation of Lime in Slag, Portland Cements

The repeated assertion that slag cement is more resistant than Portland cement to chemical attack on account of its "low lime content" obviously refers not to the total lime content of the slag-cement mix but to the low amount of free lime liberated during the setting of the cement. An exact study of the question has only been possible in recent years since accurate methods of determining free lime have been available. Investigations reported in this article showed that while slag cement, in the composite, does after setting contain less free lime than Portland cement of the same age, that the free lime liberated in the setting of slag cement is higher in proportion to the amount of Portland cement contained in the mix than it is in Portland cement alone; since the slag alone does not yield free lime, a higher proportion of the lime in Portland cement is liberated when it is mixed with slag in slag cement than in the pure state. This is confirmed by the greater amount of combined water in case of slag cement and the indicated more complete hydrolysis. In mixture with trass, the liberation of lime from the cement was considerably less than in case of the mixture with slag.—Prof. Victor Rodt in *Zement* 25:469-471, July 9, 1936.

Concrete Preservation in Marsh Water Studied

Experiments on the preservation of concrete with and without protective coatings in marsh water, conducted at the State Material Testing Bureau at Dahlem for the German Committee on Reinforced Concrete, are reported in *Zement,* Sept. 5, 1936 (25:601-604) by Prof. Victor Rodt. After seven years storage (the upper ends of each specimen in air, the bottoms in the marsh water) test slabs of "fat" mixes were only slightly corroded, and no considerable difference was observed between the three types of cement concerned—Portland, iron Portland, and blast-furnace cement. In lean mixes, however, there was considerable destruction, the cement being leached out, especially in case of the blast-furnace cement. The coated specimens in general stood up better than the untreated specimens. Of the coatings used the best was "Preolit" and the least effective was tar asphalt; between the two lay "Awa asphalt" and "Margalit." Lean mixes in the case of the coated specimens had the advantage of holding the coating better on their rougher surfaces. The coatings had disappeared at the water line at the end of the seven years (except "Preolit"), and were partly gone under water, and some destruction had taken place where the coating had disappeared.

Electric Furnaces for Calcining of Gypsum

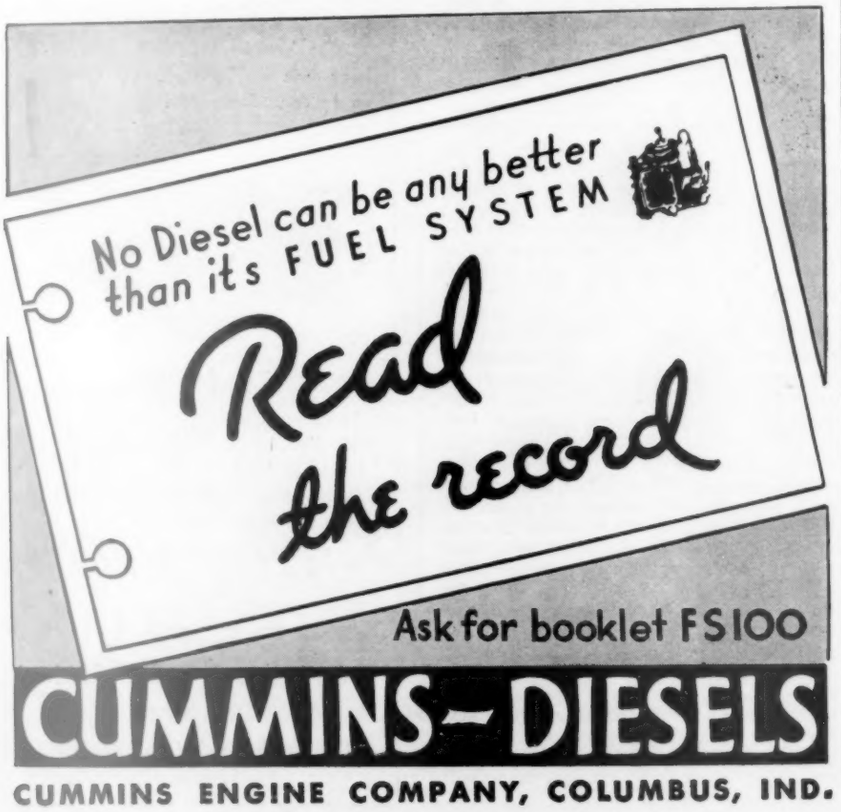
The calcining of gypsum at temperatures of 150 to 180 deg. C. requires great care to prevent local overheating and also the presence of insufficiently calcined particles. The electric furnace for calcining gypsum has the essential advantage of regulability and maintenance of the optimum temperature. In such furnaces the finely prepared raw material is fed into a kettle with a capacity of 2,000 to 3,000 kg., steadily agitated, and heated to the desired temperature. By eliminating the hot flame, the heavy construction of the ordinary kettle is replaced by light construction. The power consumption in practice is 160 to 180 k.w.h. per 1,000 kg. of gypsum, according to the amount of water to be driven off.—*Tonindustrie-Zeitung* 60:752-753, July 30, 1936.

Colloid Nature of Lime Slaking Is Denied

In contrast to recently-published works (Rodt in *Tonindustrie-Zeitung* 60:93, 539 (1936) ascribing the hardening of lime mortar to colloid-chemical processes stand a number of reported studies by other investigators, and those made for this report, based especially on microscopic and X-ray studies. For instance, the broad "amorphous" ring characteristic of a gel is lacking in X-ray pictures of slaked calcium oxide. The properties of slaked lime are ascribed to its microscopically small particle size rather than to gel-like or colloidal phenomena.—W. Dawihl, R. Flüshöh and K. May in *Tonindustrie-Zeitung* 60:761-763, Aug. 3, 1936.

Slag-Portland Cement at Various Temperatures

A series of tests of the hardening of slag-Portland cement (the use of which is said to be developing in Russia), reported in *Zement* for Sept. 5, 1936 (25:604-606) by S. A. Mironoff, indicate to the author that slag-Portland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should be classified as "high-test" (*hochwertig*) and can be recommended for use in concrete construction irrespective of season. The use of this cement is also recommended for plant construction of concrete articles which, to accelerate the hardening, it is desired to cure in steam.

Action of Common Salt on Cement or Concrete

It is known that common salt solutions dissolve larger amounts of lime out of cement or concrete than distilled water: a question of particular importance because common salt is the main salt present in sea water, and has been held partially responsible for the injurious action of sea water on concrete. Weak salt solutions have about the same effect on cement as pure water, but with increasing salt concentration more CaO is liberated from the cement than in case of distilled water. The action of the NaCl appears to decrease, that is, the amount of lime dissolved decreases, with increasing age of the cement mortar. It has been held that common salt solution is an injurious, even though slightly, agent on concrete; however, experience has also shown that cement pats stored in common salt solution make no worse impression than those stored in water. On the assumption that the calcium hydro-silicates first formed are hydrolyzed by water and still more by salt solution, there must remain more or less resistant silica gels, low in lime, which present greater obstruction to the further penetration of the salt solution and thus protect the surface. Whether this is true is being studied in further experiments that are under way.—Dr. W. Wittekindt in *Tonindustrie-Zeitung* 60:797-798, Aug. 13, 1936.

Premature Heating May Lower Concrete Strength

Theoretical and experimental studies lead the author to conclude that the strength of cement mortars and concretes is decreased by premature heating immediately following the mixing, even in winter weather, and to propose a new method of "heat control" for winter concrete construction, in which heating would not begin until 24 to 36 hr. after mixing, that is, after the set, even at low temperatures and even with quite fluid mixes. Electrical heating and steam treatment immediately following the mixing of the concrete was found to yield lower strength results than in the case of concretes stored at normal temperatures.—S. A. Mironoff in *Revue des Materiaux de Construction et de Travaux Publics,* No. 232, pp. 152-155, July, 1936.

The Chain Belt Co. of Milwaukee announces that its Portland, Ore., office has been moved from 215 S. W. First Ave. to 112-118 S. W. First Ave. The move was made in order to carry larger stocks and better serve the territory.

Statement of Ownership

PIT AND QUARRY

Statement of the ownership, management, circulation, etc., required by the Act of Congress of March 3, 1933, of PIT AND QUARRY, published monthly at 538 S. Clark Street, Chicago, Ill., for October 1, 1936.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. W. Baumgartner, who, having been duly sworn according to law, deposes and says that he is the business manager of PIT AND QUARRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse side of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, Complete Service Publishing Co.; Editor, S. A. Phillips; Business Manager, H. W. Baumgartner, all of Chicago, Ill.

2. That the owner is Complete Service Publishing Co., Chicago, Ill. That the stockholders owning 1% or more of the total amount of stock are: H. W. Baumgartner and I. A. Baumgartner, both of Chicago, Ill.

3. That there are no bondholders, mortgagees, or other security holders owning or holding 1% or more of total amount of bonds, mortgages or other securities.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

H. W. BAUMGARTNER,
Business Manager.

Sworn to and subscribed before me this 25th day of September, 1936.

(Seal)

MICHAEL MOTTO,
Notary Public.

My commission expires Aug. 2, 1937.

Just a few of the
25 Points of Superiority

Helical cut gears—noiseless, long wearing.
Unit car body and machinery table, totally heat treated.
Frictionless bearings thruout.
6 cylinder power.
Drop forged crawler shoes.
Chain crowd with automatic adjustment.
Fast operating speeds.
Safety worm boom hoist.
Separate hoist drums.
Full cab enclosing ALL machinery.

TYPES AND SIZES

Capacity	Model
⅜ yd.	20
⅜ yd. (Truck Shovel)	10
⅜ yd. (Tractor Shovel)	¾ Circle
½ yd.	30
⅝ yd.	38
¾ yd.	45
⅞ yd.	52
1 yd.	62
1¼ yd.	65

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Complete Plants Designed and Equipped.
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71 John Street New York, N. Y.

New Machinery and Supplies

Announces New Series of Diesel-Powered Trucks

The Diamond T Motor Car Co., Chicago, Ill., announces two new Diesel models which are said to be the first light-weight high-speed Diesel trucks ever put into production.

According to C. A. Tilt, president of the company, these new Diesel trucks give nearly twice as many miles to the gallon of fuel and, with Diesel fuel at present costing only about half as much as gasoline, the operator should be able to save from two-thirds to three-quarters of his present gasoline costs.

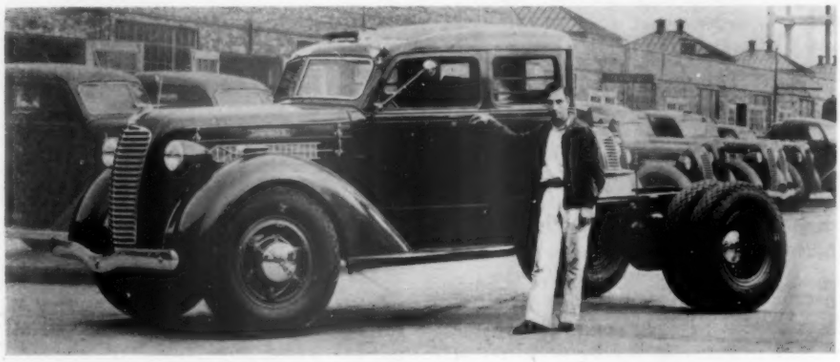
The Diesel engines in these two new trucks are built by the Hercules Motors Corp. and are of the DJX series, models that represent improvements over the high-speed Diesel engines announced by the engine manufacturer early this year.

The Model D20 engine has a 3½-in. bore, a 4½-in. stroke and its N.A.C.C. rating is 29.4 hp. The engine delivers 77 actual horsepower at 2600 r.p.m.

The Model D30 engine has a bore of 3¾ in. a stroke of 4½ in. and an N.A.C.C. rating of 33.75 hp. It develops 86 actual horsepower at 2600 r.p.m.

Both engines secure unusually clean and efficient combustion by use of a patented high-turbulence auxiliary combustion chamber. Alloy iron and steels are freely used throughout the engine.

Light-weight alloy pistons carry five rings each and piston pins of alloy steel are of the full-floating type. Connecting rods are of heat-treated chrome molybdenum steel. The Bosch injection system is employed with plunger type fuel pump, pintle-type nozzles, and vacuum governor. Frames are of pressed steel with pressed side walls of exceptional depth and alligator jaw cross-members.



The first of the new Diesel-powered tractor and truck line.

Both models have heavy full-floating two-speed rear axles, providing a choice of axle reductions that can be used at any time, combined with the entire range of transmission speeds. In the D20 the rear axle ratio is 5.14 to 1 in the high range and 7.15 to 1 in low.

For the model D30 two combinations of ratios are available. The fast axle gives a reduction of 5.62 to 1 in the high range with exceptional fuel economy and a top speed of approximately 48 m.p.h.—combined with a reduction of 7.65 to 1 in the low range, providing much greater pulling power for grades or soft roads. The slower axle offers a reduction of 6.43 to 1 with a top speed of 42 m.p.h. combined with a ratio of 8.74 to 1 for use under severe conditions.

Lockheed internal-expanding hydraulic brakes are on all four wheels with power operation by latest type B-K vacuum booster.

New Bucket-Belt Built for Light Elevator Service

The U. S. Bucket belt, a new addition to its line of elevator belts, has been announced by the United States Rubber Co., New York, N. Y. The new belt was designed to care for handling lighter stone, coal, and similar services.

The U. S. Bucket belt with its specially designed 32-oz. duck body, and high-grade cover should prove particularly valuable as an intermediary belt between the heavier duty and lighter-weight elevator belts.

Safety Hat of Duralumin Has Numerous Advantages

A new safety hat to protect men working even under the most hazardous conditions has been developed by the Davis Emergency Equipment Co., Inc., New York, N. Y. Carrying all the features of light weight, comfort, etc., of old-style hats, this new safety helmet affords greater protection than ever before possible.

The McDonald safety hat is moulded of duralumin (specially hardened heat-treated aluminum alloy)—the same metal now used in the construction of airplanes where strength combined with lightness is an essential.

Briefly, the advantages of the new helmet are said to be:

1. Duralumin crown is light in weight, durable, waterproof and non corrosive.
2. Hat will absorb the force of a blow by denting slightly when hit. In addition, the moulded lug gives greater blow-absorption as well as makes the change of head bands a simple matter.
3. Polished metal surface reflects heat and makes this hat approximately 15 deg. cooler.
4. Safety cradle for the head has a six-point suspension permitting a greater blow distribution.
5. The floating head band is interchangeable and more comfortable for it fits any head size or shape. Also it provides for considerably more ventilation.
6. There is a moulded rubber brim which is slightly flexible, therefore this hat can not be easily knocked off when used while working in close places. A chin strap may be easily attached.

Riveted-Frame Squirrel-Cage Polyphase Induction Motors

A new design of riveted-frame squirrel-cage polyphase induction motors, in frame sizes of from 1 to 15 hp. at 1,800 rpm., has recently been placed on the market by the General Electric Co., Schenectady, N. Y. The new motors, available in a variety of electrical and mechanical modifications, incorporate improvements in stator-coil insulation, frame construction, and other design features.

Co-ordination of design permits the different modifications of motors in the line to be used interchangeably for many types of power supplies and for various applications requiring open, sleeve- or ball-bearing, inclosed, inclosed fan-cooled, splashproof, vertical motors, etc. As a result of this adaptability, many special requirements may be met with the standard available line.

A new insulation system "built from the inside out" is employed for the stator-coil windings, which are of the random-wound type, with joints at the connections fused instead of soldered. Recently developed insulating materials and processes are utilized, eliminating the need for taping the end windings and producing an insulation assembly with high resistance to moisture and other common deleterious influences.

A new riveted-frame construction and new end frames made of malleable iron, with integrally cast feet, contribute to the strength

Penny Wise and Pound Foolish

From Pit & Quarry August, 1935:

There are plenty of cases of genuine silicosis, cases in which the plaintiffs have suffered real damage as the result of having been exposed to the dangerous effects of inhaling silica dust, and in many of these the sufferers have been awarded compensation in large amounts. The number of such cases is not likely to decrease unless means for confining the dust or otherwise protecting workers from it are more generally used. Most employers are [illegible]

Approved by U. S. Bureau of Mines No. B M 2111 Pneumoconiosis (Silicosis) Producing Dusts.

Dupor PLATE Respirator

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The illustration shows the radical new way of arranging filters in the respirators. Filter pads are quickly changed and cleaned. Has a larger filter area assuring easy breathing. Light in weight. Good vision. Fits in pocket. Low cost and long filter life. Send for circular. Price only $27.00 per dozen. ORDER YOURS TODAY.

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H. S. COVER
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SOUTH BEND, INDIANA

One of the new motors of open, sleeve-bearing design.

and rigidity of the motors, providing increased resistance to vibrating and shock loads. Cast-iron end shields of ample strength maintain accurate bearing alignment and uniform air gap.

Fast, Economical Drag-Line for Long-Range Operations

The Koehring Co., Milwaukee, Wis., is now offering a new series of dragline models especially designed for long-range operation. These long-range draglines, Models 702 and 802, are designed particularly for a wide range of operating flexibility. Faster than ordinary speeds, with ample power, tough digging assures high production. Economy of operation and low upkeep cost are important features of these new machines.

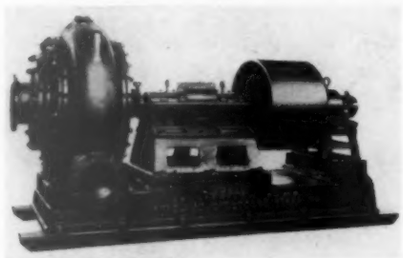
Large drainage projects, extensive stripping operations in mines or quarries, and wide canal and channel change excavation require dragline equipment specially designed for this exacting service.

Long booms, proper stability and extra wide and long crawlers are outstanding features. The exclusive Koehring swiveling-boom-point fairlead materially reduces cable wear.

Optional power equipment includes the 165-hp. Wisconsin gasoline engine, the 165-hp. Buda Diesel or the 144-hp. Caterpillar Diesel engine.

Internal Wear Reduced to Minimum in These Pumps

Long recognized for its development of abrasive-material-handling pumps, the American Manganese Steel Co. now offers a major design improvement in the Counterflow pump. The result of years of experience, the Counterflow pump combines several new design advantages with the correct application of manganese steel.



Counter-flow action reduces internal wear in manganese-steel pump.

The Counterflow pump features a wide funnel-mouth impeller; threading of the impeller bore; elimination of internal leakage; and most important—greatly reduced internal

New drag-line designed for long-range operations.

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are the modern means of producing extremely fine products and increasing Mill capacities. Tell us of your problem.

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IT'S HAISS FOR BELT CONVEYORS!

IMPROVED DESIGN
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IF IT'S SERVICE you want to buy with your belt conveyor DOLLARS, come to HAISS. You'll get more for your money—more in yardage handled, more in years of service AND A MUCH LOWER BILL FOR UPKEEP . . . Phone, wire or write for prices. Name your size.

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Who, for over 40 years, have created and sold none but equipment of demonstrable superiority in design and manufacture.

Bucket Loaders—Clamshell Buckets

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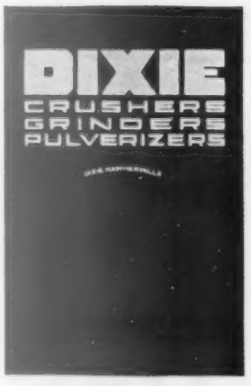
• is the only crusher with a super-tough moving breaker plate that is 26 times the average area. The result is maximum crushing power with minimum maintenance. That is why DIXIE gives record low costs in producing uniform, cubical material.

Built in 40 different sizes for all requirements in Primary, Secondary and Fine Reduction. Write for your copy of the Dixie Catalog, which gives full details and specifications.



DIXIE MACHINERY MFG. COMPANY

4209 Goodfellow Ave., St. Louis, Mo.

wear accomplished by providing clear water under pressure between the impeller shrouds and the shell side plates. This Amsco feature introduces clear water between the shrouds and plates with a "counterflow" action, replacing sand-laden water which is a cutting compound with clear water which is a lubricant.

This new design is not only available in all sizes and types of new Amsco pumps, but practically all pumps now in service may be converted at nominal cost to take advantage of "counterflow" features.

Lightweight Excavator Is An All-Purpose Machine

A new high-speed excavator, Diesel or gasoline powered, known as the Model 455 with 1-cu.yd. capacity and equipped with tractor-type crawlers, is announced by the Harnischfeger Corp., Milwaukee, Wis. Specifically designed as an all-purpose machine, the weight is radically reduced by the use of new high-tensile steels and electric welding. Though remarkably light for a one-yard machine, the Model 455 is much stronger and more rigid

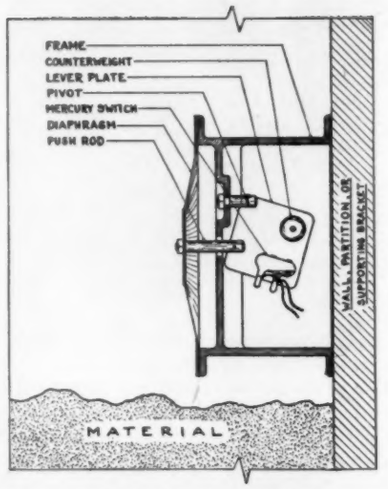
Lightweight 1-cu.-yd. shovel.

than its predecessors with greater than the usual protection against weaving. With a reinforced cylindrical car-body welded integrally with crawler frames, this new model is speed- and weight-conditioned to meet the most punishing demands of modern construction, and is further provided with 2-speed transmission for every movement in travel and digging.

Standard tractor crawlers of the type manufactured by the Allis-Chalmers Co. are used for the first time on a machine of this size. Quieter, yet more efficient, power is secured by the use of helical-cut gears in both reductions of the hoist mechanism. Two hook rollers are used on the front edge of the live roller circle and four swivel hook rollers on the tipping edge to counteract all strains and eliminate pull on the center pin to permit fast, easy swing with the heaviest dipper loads.

New Model Bin Indicator for Interior Installation

A new model bin indicator for use with any pulverized or granular material has been developed by the Bin-Dicator Co., Detroit, Mich. Essentially, the new Model C is the same in construction with the other equipment offered by the company. Its principal difference lies in the fact that it can be installed entirely inside a bin instead of requiring application on an outside wall and only a hole sufficiently large for a ½-in. conduit is required through the bin wall.



Sketch of bin-level indicator installed entirely inside a material bin.

The mechanism consists of a diaphragm attached around its edge to a circular housing and provided with a pin which contacts a counterweight assembly inside the housing. The counterweight assembly is hinged to lie against the pin, and contains a mercury switch and a lever plate.

When there is no pressure against the diaphragm due to lack of any head of material in the bin, the counterweight will be down and the switch will be in off position. When material presses against the diaphragm, however, the counterweight is swung upward with the hinge plate, and the mercury switch is positioned to sound a signal, light a lamp, or operate controls on the bin loading or unloading equipment.

Increased Drilling Efficiency Claimed for Jack-Hammer

The Ingersoll-Rand Co. has announced a new "Jackhamer" with which, it is claimed, users can get up to a third more drilling from their present compressor equipment. For example, if a portable compressor is now operating two 55-lb. drills, three of the new JA-45

The JA-45 jack-hammer.

"Jackhamers" can be substituted, resulting in an increase of ⅓ in drilling.

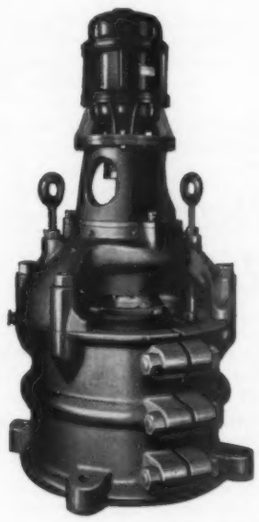
The JA-45 weighs about 45 lb. and is about 21 in. in length. It is available in dry, wet, and blower styles.

Copies of Bulletin No. 2266, describing the new drill, can be obtained from Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

Floating Eccentric Used in This Gyratory Pulverizer

The McNally-Pittsburg Mfg. Corp., Pittsburg, Kan., has just developed the Centriflex pulverizer, a new and more efficient type of gyratory pulverizer utilizing the patented floating centrifugal eccentric. This new machine can be used to crush or pulverize all materials with very little power.

Like the ordinary gyratory pulverizer, the Centriflex consists of a cone-shaped mantle in-



Gyratory pulverizer with built-in vertical motor.

closing a cone-shaped muller, in the center of which is a rotating crank. The muller does not revolve with the crank but swings freely, pulverizing material against the mantle.

Instead of a positive connection between the crank and muller as in the ordinary gyratory pulverizer, there is a yielding link—a patented floating contrifugal eccentric. As the crank shaft revolves, the resistance of the material, the action of the bumper on the crank, and the centrifugal force on the eccentric combine to oscillate the eccentric on the crank. This greatly multiplies the number of blows struck by the muller against the mantle, and the resulting rapid impact and rebound reduce the material to fine sizes.

If an unyielding body, such as a piece of tramp iron, finds its way into the machine, the floating eccentric will be forced into a position where the muller passes harmlessly over the unyielding substance.

The outstanding advantage of this new machine is said to be its unusually low power consumption. Because it reduces material more efficiently by rapid impact, the Centriflex pulverizer consumes an average of only one-third, and in some cases only one-sixth, the power consumed by ordinary pulverizers of equal capacity. In addition, the resulting product will have a very large percentage of fine sizes. The light, rapid blows cause practically no wear on the contacting elements.

Modern Methods Eliminate Freezing of Air Equipment

With below-freezing temperatures in the offing, operators of compressed-air tools are again facing the prospect of frozen lines and equipment, necessitating expensive delays for thawing-out frozen parts and possible damage to equipment.

For a number of years the Sullivan Machinery Co., Michigan City, Ind., has been supplying equipment which eliminates this danger and delay through its Tannergas and Tanner Tank anti-freeze system and recent improvements have made this system even more effective. By the use of the Tanner method drills, hoists and other air-operated equipment may be kept operating in temperatures to 70 deg. below zero and freezing of air lines is absolutely eliminated. The cost of treating 100 cu.ft. of free air per min. amounts to only about 7 c. daily. By-passed air agitates the liquid Tannergas in the Tanner Tank. This agitation throws off a dry gas which enters the air line and treats the moisture in the compressed air no matter how far it is carried.

The Tannergas is said to be odorless, non-explosive and users are soon compensated for its cost in time saved in thawing out equipment.

Co-ordinated Control System Coördinated Control System

A new system, known as the "coördinated control system," for automatically operating all of the technical operations and factors of an industrial process has been announced by The Bristol Co., Waterbury, Conn. This system makes it possible to put even the most intricate scientific process under complete automatic control, thus eliminating the necessity of leaving the manipulation and control of critical operations in the hands of plant operatives.

The control system is for processes that are developed and perfected in the laboratory and pilot plant, and depend on rigid control of such factors as the time of operations of valves (all sizes up to large gate valves), pumps, blowers, dampers, etc., and the control at a definite value or according to a time program of such variables as temperature, pressure,

YOU CAN'T REPLACE A HEAD —BUT YOU CAN *PROTECT* ONE

McDonald Safety Hat not affected by weather Permanently retains its exact size and shape.

Safety Hat of DURALUMIN Lessens Head Injuries

For the first time, Davis can offer complete head protection to men working even under the most hazardous conditions. Where a severe blow would puncture an ordinary, rigid hat, the new McDonald Safety Hat of tough, blow-resisting Duralumin metal withstands and cushions severe shocks.

You can save painful injuries as well as lives formerly lost. Minimize your compensation with this new safety helmet. Allow your men to work more confidently, skilfully, knowing that when they wear a McDonald Safety Hat they are completely protected.

Six distinct features of this new Safety Hat bearing on comfort, "wearability", etc., will interest you. Send now for a copy of the bulletin completely describing them. The coupon is for your convenience.

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Please send my copy of your Bulletin on McDonald Safety Hat to

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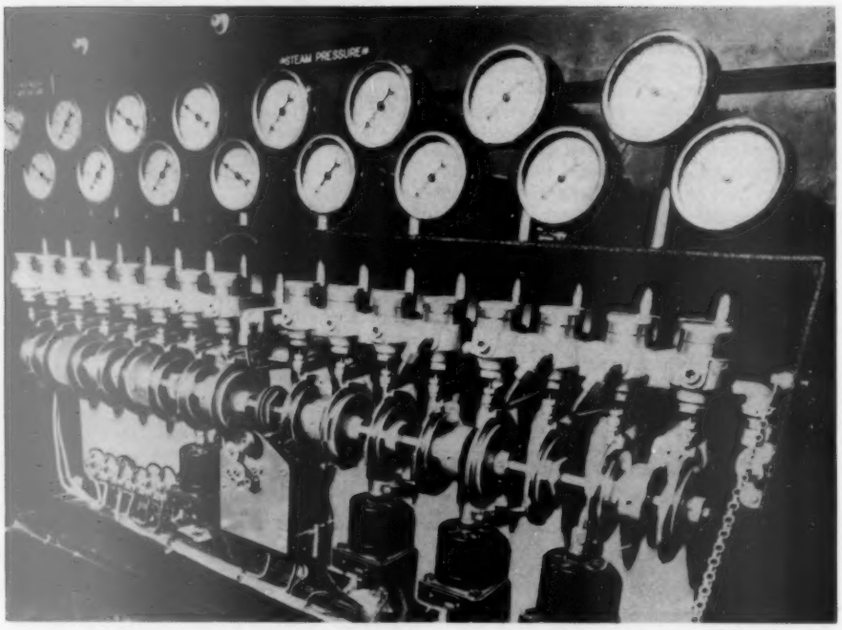

The gages and operating lay-out of the coördinated control system.

liquid level, flow, humidity, and speed for their success. It has been found in a number of cases that this control system was the tie-over from the experimental stage to the full-scale plant stage that made for success.

The "coördinated control system" can be applied to any process of which the exact schedule of operation for best over-all results is known—processes which depend upon close control for product quality—processes that give trouble because their schedule of operation is such that operators find it difficult to follow them manually.

The exact formula, sequence of operation, or control point of each factor affecting the quality of product and yield, that is recommended by the designer of a process can be built into the system. The control system carries out each step and controls each factor with split-degree accuracy.

The "system" is an automatic machine built in the form of a master control station. It consists of recording and controlling instruments built around the so-called "mechanical brain." Each system is designed and engineered for the particular process on which it is used. The instruments are standard instruments selected for their ability to perform a given duty in coöperation with each of the other instruments in the system.

The "mechanical brain" coördinates the efforts of instruments and automatically regulates all of the operations in the process. It is in a way the "pace maker" or "monitor" in that it regulates all of the operations, making them take place in their proper sequence and run for a scheduled time.

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CUT CORNERS IN CRUSHING

by taking advantage of the powerfully built American Hammermill Crusher with its low operating and maintenance costs—and its rapid reduction of material to uniform sizes free of chips and slivers. Made in capacities from ten to 100 tons per hour. Write for complete information.

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Trade Literature

American Dustube Dust Control. 24 p. (Data Book No. 22, American Foundry Equipment Co., Mishawaka, Ind.)

Auto-Drifters . . . Completely Automatic. 6 p. (Chicago Pneumatic Tool Co., New York, N. Y.)

Rockwood Single-Groove V-Belt Drives. 12 p. (Rockwood Manufacturing Co., Indianapolis, Ind.)

Buda Diesel Power. 8 p. (Bulletin No. 905, The Buda Co., Harvey, Ill.)

Crushing Rolls. 42 p. (Bulletin No. 3627, Traylor Eng. & Mfg. Co., Allentown, Pa.)

Built-Together Pumps. 16 p. (Fairbanks, Morse & Co., Chicago, Ill.)

Amsco Manganese Steel Dredge Cutter Heads. 8 p. (American Manganese Steel Co., Chicago Heights, Ill.)

W-K (Ford) Air Compressors. 6 p. (Wenzel-Kenney Manufacturing Co., Kansas City, Mo.)

Hydroseal Pumps for Sand, Slime, Sludge, Slurry. 24 p. (Catalog No. 836, Allen-Sherman-Hoff Co., Philadelphia, Pa.)

Announcing Lorain Rolled Steel Plate Lining. 4 p. (Carnegie-Illinois Steel Corp., Lorain Division, Johnstown, Pa.)

Counter-Current Classifiers. (Bulletin No. 39A, The Hardinge Co., York, Pa.)

JA-45 Jackhamer. 4 p. (Ingersoll-Rand Co., New York, N. Y.)

Chain, Sprockets, Couplings. 48 p. (Morse Chain Co., Ithaca, N. Y.)

Atlas Explosives. 44 p. (Atlas Powder Co., Wilmington, Del.)

Sturtevant Crushing, Grinding, Separating, Elevating, Conveying and Mixing Machines. 64 p. (Sturtevant Mill Co., Boston, Mass.)

Brown Air-Operated Controllers. 32 p. (Brown Instrument Co., Philadelphia, Pa.)

The Patterson UniPower Agitator. 4 p. (The Patterson Fdry. & Machine Co., East Liverpool, O.)

Single Direct-Acting Air-Cooled Compressors. 4 p. *Two-Stage Volute Centrifugal Pumps.* 4 p. Worthington Pump & Machinery Corp., Harrison, N. J.)

The Williams "Champion" Bucket. 6 p. (Wellman Engineering Co., Cleveland, O.)

Totally Enclosed Fan-Cooled Induction Motors. 4 p. *General Purpose Squirrel-Cage Motors.* 8 p. *Type KR Totally Enclosed Motors.* 2 p. (General Electric Co., Schenectady, N. Y.)

Coming Events

November 18-20, 1936. Washington, D. C. Sixteenth annual meeting, Highway Research Board. Roy W. Crum, director, 2101 Constitution Ave., Washington, D. C.

December 7-10, 1936. Memphis, Tenn.—Annual convention and show, National Sand and Gravel Assn. Peabody Hotel.

December 11, 12, 1936. Memphis, Tenn.—Annual convention and show, National Ready Mixed Concrete Assn. Peabody Hotel.

December 14-17, 1936. Chicago, Ill.—Annual meeting, Portland Cement Assn. Blackstone Hotel.

January 11-16, 1937, New Orleans, La.—Annual convention and show, American Road Builders' Assn.

January 18-20, 1937, Cincinnati, O.—Annual convention and show, National Crushed Stone Assn. Netherland-Plaza Hotel.

Book Reviews

INDUSTRIAL DUST, *by Philip Drinker and Theodore Hatch. Published by the McGraw-Hill Book Co., New York, N. Y. 316 p. 101 ill. Price $4.00.*

Both authors have served on numerous national committees appointed to consider the various problems of dust hygiene, as consultants in the investigation of industrial-dust problems and in the design and development of dust-control equipment. In this book they present the facts they have gleaned together with a critical discussion of the numerous phases of the dust problem. Their presentation covers (1) the physical aspects of dust and fine suspensions and their effect upon man, (2) the analysis, measurement and microscopy of fine dusts and (3) practical control of dusts and the use of respiratory protective devices.

Numerous texts have been written on the subject by and for the medical profession. Here, however, is one confined to basic principles and written from the engineer's standpoint.

The Easton Car & Construction Co., Easton, Pa., announces the recent appointment of the H. B. Fuller Equipment Co. as agents in the Cleveland territory. The Fuller Co. will handle the complete Easton line, including quarry equipment, dump bodies and industrial cars, lift trucks, electric bitumen heaters, railway and industrial turntables, industrial trailers, etc.

The name of the Magnetic Manufacturing Co., Milwaukee, Wis., has been changed to the Stearns Magnetic Mfg. Co., according to an announcement from R. H. "Ross" Stearns, president and general manager. The change does not involve any revision in corporate structure, management or plant location, simply being an effort on the part of the company to more closely identify its products with its trademark name Stearns.

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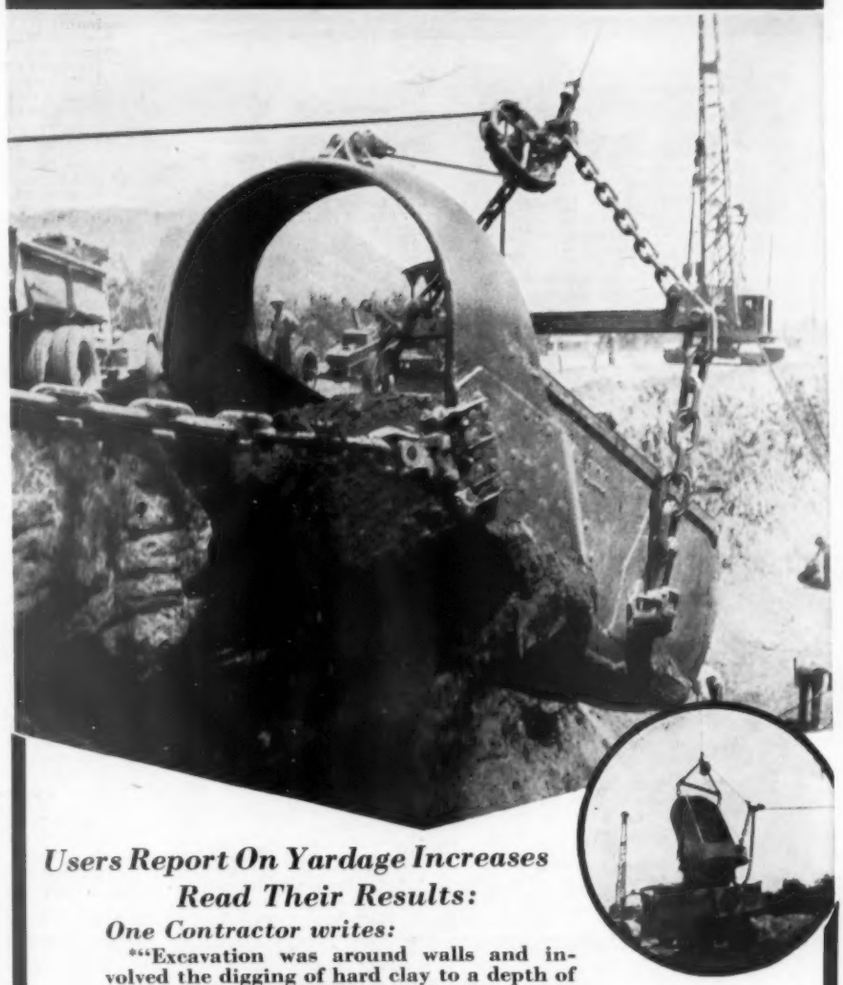

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"We are stripping 25 feet overburden, some of which is hard pan and rock. Since putting on the AUTOMATIC we are stripping at least 50% more material." * From letters in our files

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CLEARING POST OFFICE CHICAGO, ILLINOIS

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified.

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*Eagle Iron Works

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*Chicago Pneumatic Tool Co.
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*Sullivan Machy. Co.
*Traylor Engr. & Mfg. Co.
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Air Compressors (Stationary)
*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.
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*Hardinge Co.
*Raymond Bros. Impact Pulv. Co.
Sturtevant Mill Co.

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Chain Belt Co.
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Manganese Steel Forge Co.

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*General Electric Co.

Ash and Refuse-Handling Equipment
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*Jeffrey Mfg. Co.
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*Hardinge Co.
*Jeffrey Mfg. Co.
*Link Belt Co.

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*Bucyrus-Erie Co.
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*Link-Belt Co.
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Republic Rubber Co.
*Robins Conveying Belt Co.
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Republic Rubber Co.

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Republic Rubber Co.

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*Jeffrey Mfg. Co.
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*Robins Conveying Belt Co.
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*Traylor Engr. & Mfg. Co.

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*Blaw-Knox Co.
*Hendrick Mfg. Co.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
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McLanahan and Stone Corp.
*Robins Conveying Belt Co.

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Blasting Supplies
*Ensign-Bickford Co.
Heitzman Safety Blasting Plug Corp.

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Haiss Mfg. Co., Geo.
*Sauerman Bros., Inc.

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Bodies (Motor Truck, Concrete Mixing)
*Blaw-Knox Co.
Chain Belt Co.
Jaeger Machine Co.

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Goodyear Tire & Rubber Co.

Borings, Core
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

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*Tyler Co., W. S.

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Buckets (Clamshell, Orange-Peel, Etc.)
*Blaw-Knox Co.
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Owen Bucket Co.

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American Manganese Steel Co.
*Bucyrus-Erie Co.
*Link-Belt Co.
*Page Engr. Co.
*Sauerman Bros., Inc.

Buckets (Elevator and Conveyor)
Chain Belt Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.
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*Robins Conveying Belt Co.
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*Koehring Co.

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*Link-Belt Co.

Car Pullers
*Jeffrey Mfg. Co.
*Link-Belt Co.

Carriers
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works

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*Koehring Co.

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*Austin-Western Road Machy. Co.

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American Manganese Steel Co.
Chain Belt Co.
Chicago Steel Foundry Co.
*Eagle Iron Works
*Hardinge Co.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.

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Chain (Dredge and Shovel)
Manganese Steel Forge Co.

Chain Drives
Chain Belt Co.
*Link-Belt Co.

Chain (Elevating and Conveying)
American Manganese Steel Co.
Chain Belt Co.
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Chute Lining (Rubber)
Goodyear Tire & Rubber Co.

Chutes and Chute Liners
American Manganese Steel Co.
Chain Belt Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.

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*Deister Machine Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
Simplicity Engr. Co.

Clips (Wire Rope)
*American Steel & Wire Co.
*Roebling's Sons Co., John A.

Clutches
*Jeffrey Mfg. Co.
*Link-Belt Co.

Coal-Pulverizing Equipment
*Allis-Chalmers Mfg. Co.
Bonnot Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Bros. Impact Pulv. Co.

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*Deister Concentrator Co.

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*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.
*Sullivan Machy. Co.
Worthington Pump & Machy. Corp.

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Jaeger Machine Co.

Concrete Slab-Raising Equipment (Mud-Jacks)
*Koehring Co.

Condensors
*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.

Cones (Sand-Washing)
*Link-Belt Co.
Smith Engr. Works

Controllers (Electric)
*General Electric Co.

Converters (Electric)
*General Electric Co.

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Conveyor Idlers and Rolls
Chain Belt Co.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Conveyors and Elevators
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Chain Belt Co.
Chicago Steel Foundry Co.
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sturtevant Mill Co.
*Traylor Engr. & Mfg. Co.

Conveyors (Ready-Mixed Concrete)
*Blaw-Knox Co.
Chain Belt Co.
Haiss Mfg. Co., Geo.
Jaeger Machine Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

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*Allis-Chalmers Mfg. Co.

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*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Couplings (Hose)
*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.

Cranes (Crawler and Locomotive)
*Austin-Western Road Machy. Co.
*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
Industrial Brownhoist Corp.
*Koehring Co.
*Lima Locomotive Works, Inc.
*Link-Belt Co.
Michigan Power Shovel Co.

Cranes (Electric Traveling)
Industrial Brownhoist Corp.

Cranes (Overhead)
Industrial Brownhoist Corp.

Crusher Parts
American Manganese Steel Co.
*American Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.

Crushers (Cone)
Nordberg Mfg. Co.

* See also information in the 1936 Pit and Quarry HANDBOOK.

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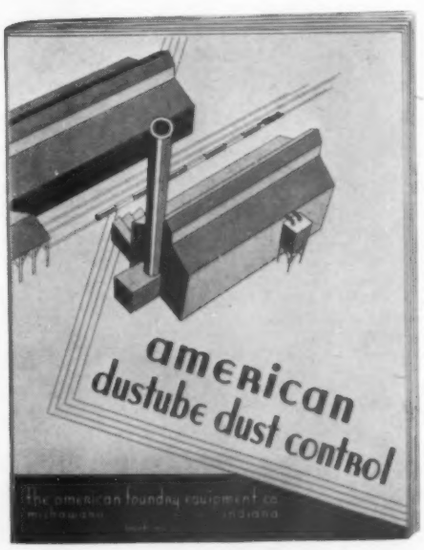

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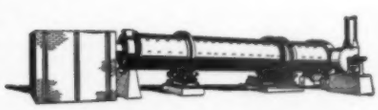

HARDINGE COMPANY
INCORPORATED
YORK, PENNA.—Main Office & Works
NEW YORK—122 E. 42nd St. CHICAGO—205 W. Wacker Drive

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng Corp
Sturtevant Mill Co.

Crushers (Jaw and Gyratory)
*Allis-Chalmers Mfg. Co.
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Bacon, Inc., Earle C.
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*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
New Holland Machine Co.
Nordberg Mfg. Co.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.

Crushers (Ring)
*American Pulverizer Co.

Crushers (Roll)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Austin-Western Road Machy. Co.
Bonnot Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Robins Conveying Belt Co.

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*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Austin-Western Road Machy. Co.
Bonnot Co.
New Holland Machine Co.

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*Allis-Chalmers Mfg. Co.
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*Austin-Western Road Machy. Co.
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*Link-Belt Co.
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*Link-Belt Co.
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*Page Engr. Co.

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*Morris Machine Works

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*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.
*Sullivan Machy. Co.
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*Sullivan Machy. Co.
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Pennsylvania Drilling Co.

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*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.
*Sullivan Machy. Co.
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*Ingersoll-Rand Co.
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Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.
*Sullivan Machy. Co.

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*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.
*Sullivan Machy. Co.
Worthington Pump & Machy. Corp.

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*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.
*Jeffrey Mfg. Co.
*Sullivan Machy. Co.
Worthington Pump & Machy. Corp.

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*Sullivan Machy. Co.

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*Ingersoll-Rand Co.

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*Hardinge Co.
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*Traylor Engr. & Mfg. Co.
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*Blaw-Knox Co.
*Sly Mfg. Co., W. W.
*Western Precipitation Co.

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*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
*American Fdry. Equip. Co.
*Blaw-Knox Co.
*Sly Mfg. Co., W. W.
*Raymond Bros. Impact Pulv. Co.
*Western Precipitation Co.

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*Allen-Sherman-Hoff Co.
*American Fdry. Equip. Co.
*Blaw-Knox Co.
*Western Precipitation Co.

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*American Fdry. Equip. Co.
*Blaw-Knox Co.
*Sly Mfg. Co., W. W.
*Western Precipitation Co.

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*Allen-Sherman-Hoff Co.

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*Allis-Chalmers Mfg. Co.
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*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Bonnot Co.
Hetherington & Berner, Inc.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
Sturtevant Mill Co.

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*Chicago Pneumatic Tool Co.
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*Chicago Pneumatic Tool Co.
Cummins Engine Co.
*Fairbanks, Morse & Co.
*Ingersoll-Rand Co.
Nordberg Mfg. Co.
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*Ingersoll-Rand Co.
*Morris Machine Works
Nordberg Mfg. Co.

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*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

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*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bonnot Co.
Chain Belt Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
*Robins Conveying Belt Co.
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Buffalo Wire Works Co.

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Davis Emergency Equip. Co.

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*Allen-Sherman-Hoff Co.

Fuses (Detonating)
*Ensign-Bickford Co.

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*General Electric Co.

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Goodyear Tire & Rubber Co.
Republic Rubber Co.

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Gates (Clamshell)
Haiss Mfg. Co., Geo.
*Link-Belt Co.

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Chain Belt Co.
*General Electric Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

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Chain Belt Co.
*General Electric Co.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.

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Generator Sets (Engine)
*General Electric Co.

Generator Sets (Motor)
*General Electric Co.

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*General Electric Co.

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Lewistown Foundry & Machine Co.

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Davis Emergency Equip. Co.

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Grapples
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Grating (Steel)
*Blaw-Knox Co.
*Hendrick Mfg. Co.

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Grizzlies
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Eagle Iron Works
*Hendrick Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mach. Co.
Manganese Steel Forge Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.

Guards (Wire)
Manganese Steel Forge Co.

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Hetherington & Berner, Inc.
Taylor Forge & Pipe Works

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*General Electric Co.

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Davis Emergency Equip. Co.

Hoists
*Bartlett & Snow Co., C. O.
*Chicago Pneumatic Tool Co.
Hetherington & Berner, Inc.
*Ingersoll-Rand Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Sauerman Bros., Inc.
Smith Engr. Works
*Sullivan Machy. Co.

Hoppers
*Hendrick Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Hose (Air, Steam and Water)
*Chicago Pneumatic Tool Co.
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
*Ingersoll-Rand Co.
Republic Rubber Co.
Worthington Pump & Machy. Corp.

Hose (Radiator-Engine Cooling)
Goodyear Tire & Rubber Co.
Republic Rubber Co.

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Idlers
American Manganese Steel Co.
Chain Belt Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works

Indicators (Gas)
Davis Emergency Equip. Co.

Kilns and Coolers (Rotary)
*Allis-Chalmers Mfg. Co.
Bonnot Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

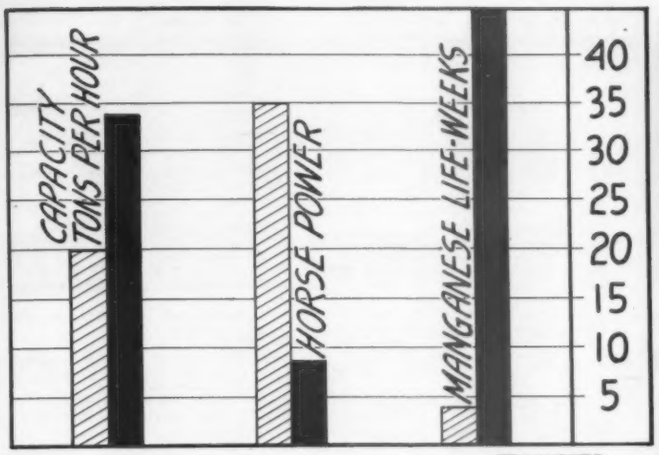
Kilns (Vertical)
*Hardinge Co.

Lights (Flood)
*General Electric Co.

Lime-Handling Equipment
*Hardinge Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Raymond Bros Impact Pulv. Co.
*Robins Conveying Belt Co.

Lime and Hydrating Plants
*Hardinge Co.

* See also information in the 1936 Pit and Quarry HANDBOOK.

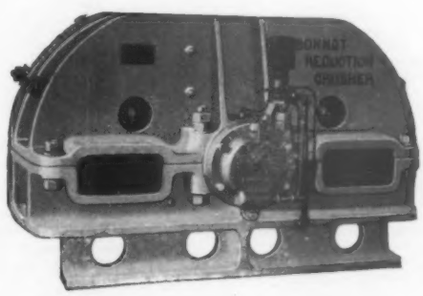


BONNOT
REDUCTION CRUSHERS CUT OPERATING COST

Comparisons may be odious, but actual operating records over a long period of time have produced a record for low cost operating that deserves your careful consideration of the above chart.

The BONNOT CRUSHER assures increased production of perfectly crushed material at a considerable saving in cost. There is less maintenance; no rubbing or abrasive action to produce fines. Less rejections; no oversize or slabs to show up in finished product. Less power; perfect crushing means free crushing, a beam or snap action that cuts down power—30 tons per hour of 1" minus material with less than 9 horsepower.

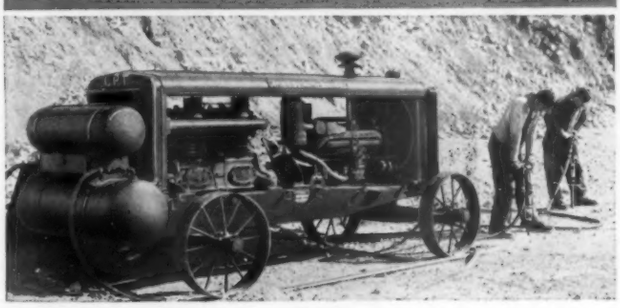
Write for complete details.



Write for Bulletin 160

THE BONNOT CO.
CANTON, OHIO
NEW YORK OFFICE, 30 CHURCH STREET

CP PORTABLE COMPRESSORS + CP ROCK DRILLS = PROFITS



THIS CP Two-Stage Air-Cooled Portable Gasoline-Driven Compressor and the CP-42 Sinker Drills are earning profits for a stone quarry.

High compressor efficiency and high drilling speed, dependability and low maintenance cost, backed by a strong service organization, enable CP Compressors and CP Drills to return profits to Contractors, Quarries and others the world over.

Write for Bulletin 758 which describes these outstanding compressors — gasoline and Diesel-driven — and for Bulletin 850 describing CP Sinker Drills.

CHICAGO PNEUMATIC TOOL COMPANY
Sales and Service Branches All Over the World
6 EAST 44th STREET • NEW YORK, N. Y.

AIR & GAS COMPRESSORS • ROCK DRILLS
DIAMOND CORE DRILLS • DIESEL ENGINES
ELECTRIC TOOLS • PNEUMATIC TOOLS
VACUUM PUMPS & CONDENSERS
OIL WELL ROCK BITS, REAMERS & TOOL JOINTS

CHICAGO PNEUMATIC

C-36-3-½

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Lime Kilns
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

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Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

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*General Electric Co.

Locomotives (Electric, Gas, Kerosene and Steam)
*General Electric Co.
*Lima Locomotive Works

Locomotives (Gas-Electric)
*General Electric Co.

Locomotives (Oil-Electric)
*General Electric Co.

Locomotives (Storage Battery)
*General Electric Co.

Locomotives (Trolley-Battery)
*General Electric Co.
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Manganese Steel Forge Co.

Manganese Steel (Plates and Sheets)
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Manganese Steel Forge Co.

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Cover, H. S.
Davis Emergency Equip. Co.

Measuring Devices (Electric)
*General Electric Co.

Mechanical Rubber Goods
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Mill Liners and Linings
American Manganese Steel Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Mills (Grinding) (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
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*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Fdy. & Mch. Co.
*Raymond Bros. Impact Pulv. Co.
*Traylor Engr. & Mfg. Co.

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Motors and Generators
*Allis-Chalmers Mfg. Co.
*Fairbanks, Morse & Co.
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*American Steel & Wire Co.

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*Tyler Co., W. S.

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*Deister Concentrator Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Spray)
*Deister Concentrator Co.

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*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Partitions (Wire)
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Jaeger Machine Co.
*Koehring Co.

Perforated Metal Plates
*Allis-Chalmers Mfg. Co.
Chicago Perforating Co.
*Hendrick Mfg. Co.

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Taylor Forge & Pipe Works

Pipe Flanges
Hetherington & Berner, Inc.
Taylor Forge & Pipe Works

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Pneumatic Conveying Systems (See Conveyors—Pneumatic)

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*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

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*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.

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*American Steel & Wire Co.

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*Blaw-Knox Co.

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*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Bros. Impact Pulv. Co.

Pulverizers (See also Crushers; Mills; etc.)
*American Pulverizer Co.
*Austin-Western Road Machy. Co.
Bonnot Co.
*Gruendler Crusher & Pulverizer Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
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Lewistown Foundry & Machinery Co.
New Holland Machine Co.
*Raymond Bros. Impact Pulv. Co.
Sturtevant Mill Co.
Traylor Engr. & Mfg. Co.

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Pumps (Air-Lift)
*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.

Pumps (Cement Slurry)
*Allen-Sherman-Hoff Co.
*Morris Machine Works

Pumps (Centrifugal)
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Chain Belt Co.
*Fairbanks, Morse & Co.
Hetherington & Berner, Inc.
*Ingersoll-Rand Co.
Kansas City Hay Press Co.
*Morris Machine Works
Worthington Pump & Machy. Corp.

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*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Bucyrus-Erie Co.
*Fairbanks, Morse & Co.
Hetherington & Berner, Inc.
Kansas City Hay Press Co.
*Morris Machine Works
Worthington Pump & Machy. Co.

Pumps (Sand and Gravel
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
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*Fairbanks, Morse & Co.
Hetherington & Berner, Inc.
Ingersoll-Rand Co.
Kansas City Hay Press Co.
*Morris Machine Works

Pumps (Sump)
*Chicago Pneumatic Tool Co.

Pumps (Vacuum)
*Chicago Pneumatic Tool Co.

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*General Electric Co.

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*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

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Stulz-Sickles Co.

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Davis Emergency Equip. Co.

Sand Separators
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Simplicity Engr. Co.
Smith Engr. Works

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*Hardinge Co.

Sand-Settling Tanks
*Jeffrey Mfg. Co.
*Link-Belt Co.
Smith Engr. Works

Scales
*Fairbanks, Morse & Co.
Menick Scale Mfg. Co.

Scales (Track and Truck)
*Fairbanks, Morse & Co.
Menick Scale Mfg. Co.

Scrapers (Power Drag)
*Austin-Western Road Machy. Co.
*Link-Belt Co.
*Sauerman Bros., Inc.

Screens
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Audubon Wire Cloth Corp.
*Austin-Western Road Machy. Co.
Bacon, Inc., Earle C.
Buffalo Wire Works Co.
Chain Belt Co.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hardinge Co.
*Hendrick Mfg. Co.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
Manganese Steel Forge Co.
McLanahan and Stone Corp.
Nordberg Mfg. Co.
*Productive Equip. Corp.
*Roebling's Sons Co., John A.
*Robins Conveying Belt Co.
Simplicity Engr. Co.
Smith Engr. Works
Sturtevant Mill Co.
Symons Bros. Development Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Screens (Vibrating or Shaking)
*Allis-Chalmers Mfg. Co.
Buffalo Wire Works Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
*Productive Equip. Corp.
*Robins Conveying Belt Co.
Simplicity Engr. Co.
Smith Engr. Works
Sturtevant Mill Co.
Symons Bros. Development Co.
*Tyler Co., W. S.

Scrubbers
Knickerbocker Co.
*Tyler Co., W. S.

Separators (Air) (See Air Separators)

Sheaves
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Chain Belt Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Link-Belt Co.
*Jeffrey Mfg. Co.
McLanahan and Stone Corp.

Shovels (Electric, Internal-Combustion and Steam)
*Austin-Western Road Machy.
*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
Industrial Brownhoist Corp.
*Koehring Co.
*Lima Locomotive Wks., Inc.
*Link-Belt Co.
Michigan Power Shovel Co.

Silos
Chain Belt Co.

Skip Hoists and Skips
*Allis Chalmers Mfg. Co.
Chain Belt Co.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

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*Cincinnati Rubber Mfg. Co.

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Knickerbocker Co.

Speed Reduction Units
Chain Belt Co.
*General Electric Co.
*Link-Belt Co.

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Sprays
*Deister Concentrator Co.

Sprockets and Chain
American Manganese Steel Co.
Chain Belt Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Stackers
*Jeffrey Mfg. Co.

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*General Electric Co.

Steel (Alloy)
(See Alloys—Steel)

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Steel Plate Construction
Hetherington & Berner, Inc.
Manganese Steel Forge Co.

Stone Grapples
Owen Bucket Co.

Storage Equipment
Chain Belt Co.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Kern Co., Fred T.
*Link-Belt Co.
*Sauerman Bros., Inc.

Sweeping Systems
*Allen-Sherman-Hoff Co.

Switchboards (Electric)
*General Electric Co.

Switches (Safety)
*General Electric Co.

Tanks
*Hendrick Mfg. Co.
*Link-Belt Co.

* See also information in the 1936 Pit and Quarry HANDBOOK.

ABRASION RESISTING/ SUPER-WIRE BUFF-ALOY

A WEAVE FOR ALL SCREENING REQUIREMENTS

Whatever your screening requirements are in the way of shape, size and weave they can be doubly fulfilled with BUFF-ALOY wire cloth. Doubly in that the screening, whatever its specifications may be, will wear longer than ordinary wire cloth. BUFF-ALOY is a scientifically developed alloy steel made especially for the most difficult tasks in modern screening. Wear-resisting, long lasting BUFF-ALOY wire cloth will *satisfy your demands.*

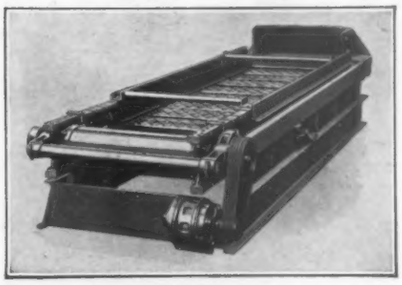
SEND FOR BULLETIN 101-B

BUFFALO WIRE WORKS COMPANY

(Formerly Scheeler's Sons—Established 1869)

526 Terrace, Buffalo, N.Y. Philadelphia Branch: 11 So. 7th St.

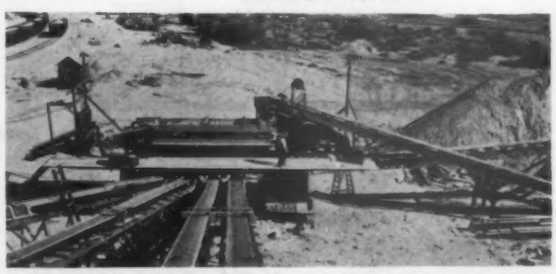
SYMONS SCREENS



Sets level
Saves head-room
Greater capacity
Closer sizing
Automatic feed
Dust-tight bearings

Used on the World's largest projects including COULEE DAM, COLORADO RIVER AQUEDUCT, BOULDER DAM, T.V.A. and many others. Write for performance records.

Symons Bros. Development Co.
1462 N. Stanley Ave., Hollywood, California
and
Nordberg Manufacturing Company
Milwaukee, Wisconsin



At Hawley plant of Colorado River Aqueduct, Symons Screens are separating 200 tons per hour into four graded sizes

General view of east end of pit at the Nevada Consolidated Copper Corp., McGill, Nevada.

in CONNECTION *with*

Better Blasting

In the great pit at Nevada Consolidated Copper Corporation, each blast is planned to loosen and break up the ore for easy removal. Holes, drilled 5′ to 7′ below grade, are sprung and the chambers loaded with powder. Ten sticks tied in a bundle are lowered by means of Cordeau to the center of the charge, and the hole is then tamped. As many as 60 holes, connected by lines of Cordeau along the surface, are fired at one time.*

In certain cases, when column loading is desirable to avoid back break, the charges are spaced at predetermined intervals throughout the length of the hole. Small bundles of stick powder are spaced at intervals and detonated by one length of Cordeau in the hole.

Thus Cordeau, the insensitive detonating fuse, simplifies loading, lessens hazard, increases the effectiveness of each charge by insuring proper detonation, and produces better blasting—easier removal.

Write for a free copy of the Cordeau Book.

* The largest blast with Cordeau-Bickford of which we have record was made at Manistique, Michigan, in 1932 and contained 4,000 holes!

The ENSIGN-BICKFORD Company
Simsbury . . . . . Connecticut
SAFETY FUSE SINCE 1836
Cordeau-Bickford Detonating Fuse

CB54

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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*Link-Belt Co.
Smith Engr. Works

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*Hendrick Mfg. Co.
*Tyler Co., N. S.

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Transmission Machinery
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Chain Belt Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Transformers
*General Electric Co.

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*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

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Jaeger Machine Co.

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Goodyear Tire & Rubber Co.

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*Jeffrey Mfg. Co.
*Link-Belt Co.

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*General Electric Co.

Valves (Air)
Worthington Pump & Machy. Corp.

Valves (Pump)
*Cincinnati Rubber Mfg. Co.
Taylor Forge & Pipe Works

Variable Speed Reducers or Transmissions
Chain Belt Co.
*Link-Belt Co.

Vibrating Screen Plate
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

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*Jeffrey Mfg. Co.
*Tyler Co., W. S.

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*Koehring Co.

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*Eagle Iron Works
Haiss Mfg. Co., Geo.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Foundry & Mach. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

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Menick Scale Mfg. Co.

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*General Electric Co.
Stulz Sickles Co.

Welding Supplies
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*General Electric Co.
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*Roeblings Sons Co., John A.
Stulz Sickles Co.

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*Eagle Iron Works

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*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Wire and Cable (Electric)
*American Steel & Wire Co.
*General Electric Co.
*Roebling's Sons Co., John A.

Wire Cloth
Audubon Wire Cloth Corp.
Buffalo Wire Works Co.
Cleveland Wire Cloth & Mfg Co.
Manganese Steel Forge Co.
*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
Tyler Co., W. S.

Wire Rope
*American Steel & Wire Co.
Buffalo Wire Works Co.
*Hazard Wire Rope Co.
*Roebling's Sons Co., John A.
*Williamsport Wire Rope Co.

Wire Rope Fittings
*American Steel & Wire Co.
Buffalo Wire Works Co.
*Hazard Wire Rope Co.
*Page Engr. Co.
*Roebling's Sons Co., John A.
*Williamsport Wire Rope Co.

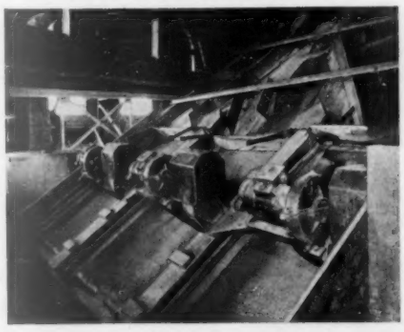
Wire Rope Slings
*American Steel & Wire Co.
*Hazard Wire Rope Co.
*Roebling's Sons Co., John A.
*Williamsport Wire Rope Co.

Wire (Welding)
American Manganese Steel Co.
*American Steel & Wire Co.
Manganese Steel Forge Co.
*Roebling's Sons Co., John A.

Worm Gears (See Gears and Pinions)

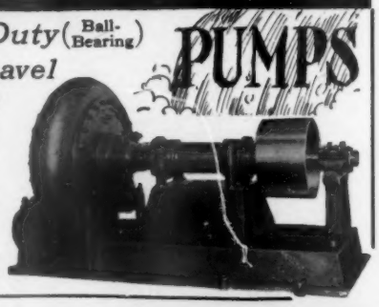
LEAHY

FOR FINE SCREENING



The ORIGINAL DEISTER CONCENTRATOR COMPANY
911 Glasgow Ave. Incorporated 1906 Ft. Wayne, Ind.
New York Office, 104 Pearl St., New York

LIGHTNING
Heavy-Duty (Ball-Bearing) Sand and Gravel PUMPS



High efficiency — low operating cost—precision workmanship — wear-resisting, non-heating bearings even when operated under extremely high heads. WRITE
KANSAS CITY HAY PRESS CO.
KANSAS CITY, . . . MO.

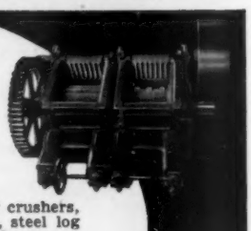
CUT your rope costs with LAY-SET Preformed

One of numerous quarries serviced by HAZARD reports LAY-SET *Pre*formed reduced wire rope costs to less than half.

This is typical of how LAY-SET *Pre*formed has been cutting rope costs for literally thousands of operators. Specify LAY-SET for *your* work.

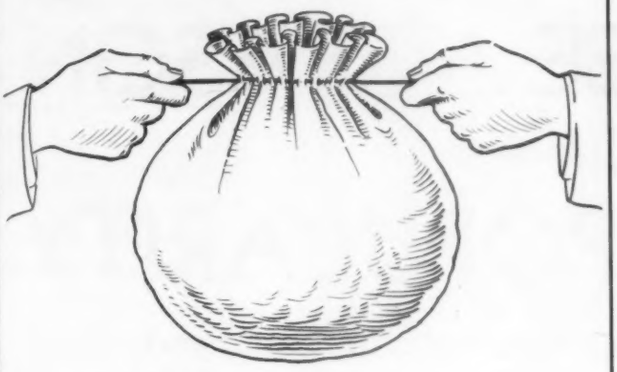
HAZARD WIRE ROPE COMPANY, Wilkes-Barre, Pennsylvania
An Associate Company of American Chain Company, Inc.
IN BUSINESS FOR YOUR SAFETY
District Offices: New York, Chicago, Philadelphia, Pittsburgh, Birmingham, Denver, Los Angeles, Tacoma, Fort Worth, San Francisco
LAY-SET Preformed Wire Rope

McLANAHAN EQUIPMENT for ROCK—SAND—GRAVEL



Single and double roll and jaw crushers, hammer mills, super dry pans, steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists. Complete portable, semi-portable and stationary crushing, screening and washing plants for different capacities of any materials.

McLanahan & Stone Corporation
Established 1835
Hollidaysburg, Pennsylvania



Tighten the Purse Strings with SIMPLICITY Screens

Why squander your profits on extravagant power costs, excessive operating expense and exorbitant maintenance, when you can avoid these losses by taking advantage of the many economy features built into SIMPLICITY Gyrating Screens! Fourteen years of continuous development have brought Simplicity Screens to their present-day efficiency. Write for descriptive folder.

SIMPLICITY ENGINEERING COMPANY
DURAND, MICHIGAN

The Profitable Way to Sell Concrete

JAEGER DUAL-SPEED TRUCK MIXERS of Man-Ten Long Life Steel

Rear Lift Hoist Attachment
One-Man Chute Saves Minutes Every Trip

Write for New Catalog
THE JAEGER MACHINE CO.
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OK ANYWHERE ANYTIME ANY JOB

O K Portable Air Compressors

When it's tough going, and steady, speedy air-tool work is vital to profits—then put an OK Compressor on the job, powered with a Hercules engine. With efficient air cooling system, automatic lubrication, trouble-proof valves, positive air regulation and perfect air throttling control, the OK Air Compressor can be depended upon to reduce your operating costs. Write for full information.

O. K. Clutch and Machinery Co.
Columbia, Pennsylvania

SULLIVAN DETACHABLE BIT . . . . .

New design
New long life
New increased footage
New decreased drilling costs

For new, improved results try the Sullivan detachable bit. A departure from conventional cross bit design gives superior drilling performance. You will find *satisfaction.*

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MACHINERY COMPANY
307 N. MICHIGAN AVE., CHICAGO, ILL.

THERE MUST BE A REASON
FOR
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For nearly seven years Pit and Quarry has led all other papers in this field in subscriptions among producers. It is the most popular paper —with its popularity constantly growing, as is shown by the increasing number of subscriptions and the increasing margin of lead.

The reason? At no time during the depression has Pit and Quarry sacrificed the high standard of quality of the editorial matter. It held its editorial staff, and kept its field editor on the road, wearing out a car in one to two years. The illustrations have always been plentiful, the articles easy to read.

Costly to do this? Yes it is. But it has been worth the cost—for producers realize that Pit and Quarry has worked *with* them. Savings effected by change from biweekly to monthly publication have been passed on in the form of a reduced subscription price—not pocketed. And the high percentage of subscribers who renew their subscriptions attest their loyalty to a publication understanding their problems and working *with* them.

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PIT AND QUARRY PUBLICATIONS,
538 So. Clark Street, Chicago, Illinois.

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1 year ($1.00).....3 years ($2.00) starting with the November issue. (Foreign add $1.00 per year.)

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Company Name.....

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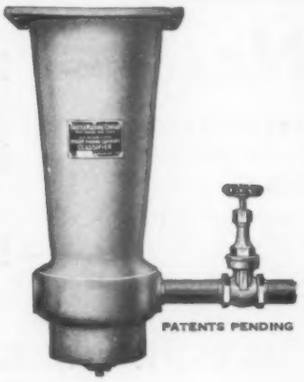
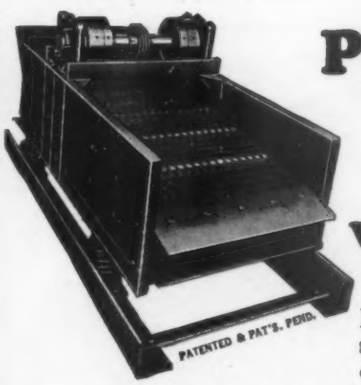
We Produce.....

COMPOUND FUNNEL CLASSIFIER

For sizing minus 5/16" gravel and sand, and for cleaning it by washing out silt and other light impurities.

Descriptive Bulletin No. 23





PLAT-O

Improved Heavy Duty

VIBRATING SCREEN

Built in all standard sizes and in from one to three decks.

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DEISTER MACHINE COMPANY

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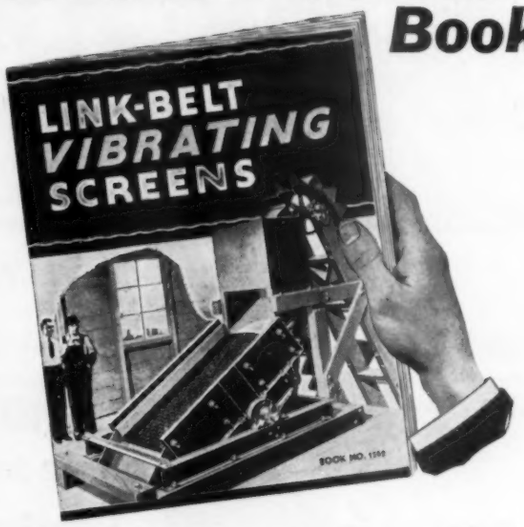

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Owen's record in designing and building successful buckets for uncommon service is the natural result of long specialized experience and the availability of exclusive patented features of fundamental importance.

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Write for detailed information

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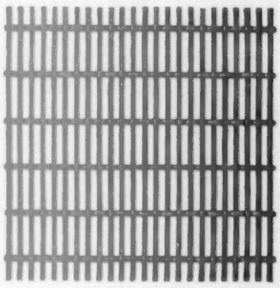

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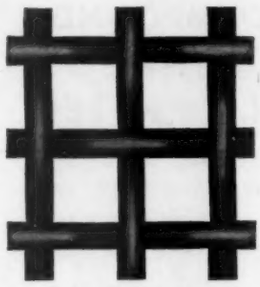
ALLOY No. 2

A super wearing Steel developed to resist the abrasion and vibration of modern screening demands.

"CLEVELAND" SCREENS

A wire cloth of guaranteed accuracy backed by fine workmanship and an effort to satisfy.

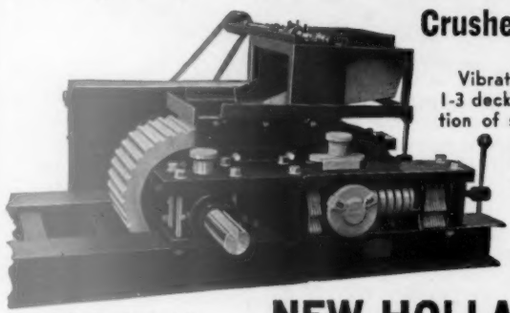
Available in Square Mesh and Rolled Slot. A trial will convince you of the superiority.



2 Mesh .162 Ga.

THE CLEVELAND WIRE CLOTH & MFG. COMPANY
574 E. 78th St. CLEVELAND, OHIO

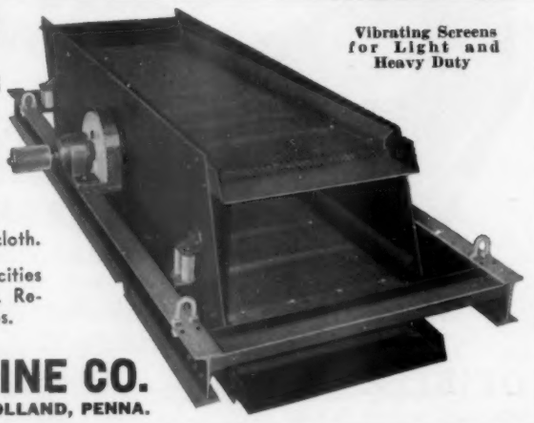
For Speedy Production New HOLLAND Crushers and Screens



Roll Crusher with Pulsator Feeder

Vibrating Screens. Six sizes; 1-3 decks. Positive circular motion of screen and cloth. No base vibration. Perfect balance. Rubber cushioned frame and cloth.

Roll Crushers. Capacities up to 75 tons per hour. Reduction from 3" to fines. Write for bulletins.



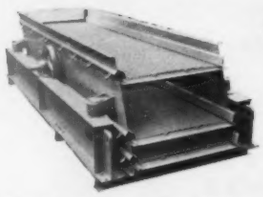
Vibrating Screens for Light and Heavy Duty

NEW HOLLAND MACHINE CO.
P. O. Box No. 200 NEW HOLLAND, PENNA.

TYLER SCREENS

CIRCLE-THROW MECHANICALLY AND ELECTRICALLY-VIBRATED

TON-CAP



and Woven Wire Screen
In all Meshes and Metals

Scrubbers and Dryers

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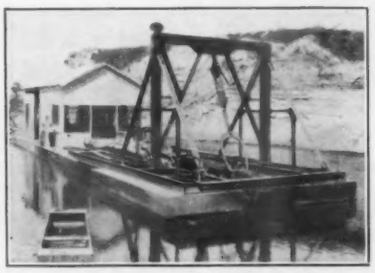
EAGLE SWINTEK SCREEN NOZZLE LADDER LOWER YOUR COST



Will eliminate stoppages and slug pumping — insuring an even, constant feed of solids to the suction nozzle — with less power — greatly decreasing the cost per yard of material produced.

Write for descriptive literature and let us tell you how this can be done with your dredge.

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TODAY IS THE DAY

to write for the new MICHIGAN POWER SHOVEL Bulletin "P." Fully illustrated with action pictures of the popular Michigan Model T-6 shovel-crane.

Complete specifications included

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BENTON HARBOR . . . . . MICHIGAN

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BUCKET ELEVATORS
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AGENTS IN PRINCIPAL CITIES

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SLY CLOTH BAG Dust Filters

FOR DUST CONTROL

SUPPRESSION···POSITIVE COLLECTION···DISPOSAL

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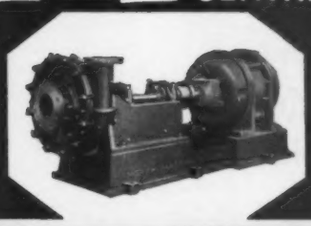
4726 Train Ave., Cleveland, Ohio

MORRIS CENTRIFUGAL PUMPS



For handling abrasive materials, corrosive liquids, or clear water. Special designs and materials for each service to provide long life, maintenance of initial high efficiency and low upkeep cost.

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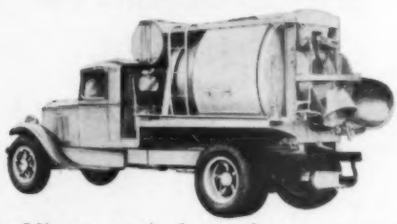
Baldwinsville, N. Y.

MORRIS MACHINE WORKS · BALDWINSVILLE, N.Y.

REX MOTO-MIXERS



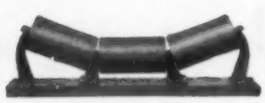
Rex Moto-Mixers are the key to lowest-cost methods of delivering Ready-Mixed Concrete to the job.
Aggregate Handling Systems Cement Elevators
Rex-Stearns Belt Idlers

CHAIN BELT COMPANY
1646 W. Bruce St., Milwaukee, Wis.
REX CONSTRUCTION EQUIPMENT

Many years of service from CINCINNATI CONVEYOR BELTS

THE CINCINNATI RUBBER MFG. CO.
CINCINNATI, OHIO

ROBINS Conveyor Idlers



Robins Idlers are easy on belts because of free operation and furthermore are not prone to get out of order and cause drag. Robins patented "one shot" lubrication is another feature. Robins Trainer Idlers keep belts in line. *Send for Bulletins of interest to you.*

Also
BELT CONVEYORS—SCREENS—GATES—FEEDERS

MATERIAL HANDLING ROBINS EQUIPMENT

ROBINS CONVEYING BELT CO.
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KNICKERBOCKER Soft Stone Eliminator

Processes gravel or crushed stone to meet any reasonable soundness or abrasion specification by rapid, economical, thorough elimination of soft, friable, or absorbent pieces. Remarkably low operating cost and will pay for itself quickly. Write for details.

THE KNICKERBOCKER CO
603 Liberty St.
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Chapman Gravel Co., Shiawasse Co., Mich.—user of K.S.S.E. for 5 yrs.

SAUERMAN LONG RANGE MACHINES

SLACKLINES and DRAG SCRAPERS

are the most economical machines for mining sand and gravel because of their long reach, large loading capacity and simple operation. These same features make these machines superior for many problems of storing and reclaiming bulk materials.

Write for Catalog.

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USED AND SURPLUS EQUIPMENT IS ACTIVELY IN DEMAND RIGHT NOW

With production in high gear and with hundreds of operators making plans for increasing capacities and operating schedules for the coming season, all types of machinery and equipment are in greater demand than at any time in six or seven years. Pit and Quarry's Broadcast Section has consistently sold excavators, locomotives, cars, crushing, grinding and screening equipment, elevators and conveyors, pumps, motors, hoists . . . everything in the way of equipment, for producers and dealers. It reaches the people who want to buy. It brings seller and buyer together. It finds and fills jobs. Note the low rates below.

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3 in.	10.75	10.70	10.65	10.60	10.50	10.40
4 in.	14.25	14.20	14.15	14.10	14.00	13.90
5 in.	17.75	17.65	17.55	17.45	17.25	17.05
1/3 page	35.25	35.15	35.10	35.00	34.80	34.60
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Unique principle of hydrosealing both sides of the impeller against abrasive wear, cuts maintenance to a fraction and saves ⅓ in power costs in pumping sand, gravel, rock and other abrasive materials—Estimated economies guaranteed. Sizes 2" to 22", pulley or motor drive. Descriptive Catalog sent on request.

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EQUIPMENT FOR QUARRIES

STATIONARY COMPRESSORS
for permanent installation in operation of quarries and mills
PORTABLE COMPRESSORS
for preliminary work in opening up new quarries
DIESEL AND GAS ENGINES
for driving the crushing plant
WAGON DRILLS AND TRIPOD (DRIFTER) DRILLS
for snake holing and deep ledge work
ROCK HAMMERS
for boulder popping and shallow bench work
PUMPS
for all services
V-BELT DRIVES

WORTHINGTON PUMP AND MACHINERY CORPORATION
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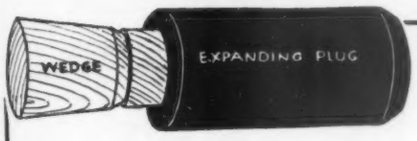


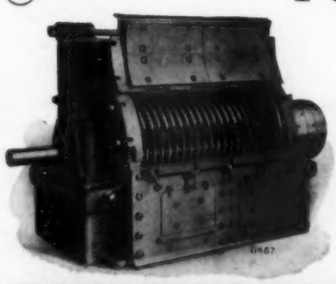
The Heitzman Safety Blasting Plug is foolproof, sealing the charge in the drill hole perfectly. Saves tamping time and assures uniform stemming. Eliminates extra holes in cases of misfiring. Brings down more material with a minimum of explosives.

SAFE • EFFICIENT • ECONOMICAL

WRITE FOR FOLDER AND FREE SAMPLES
State whether firing is done by fuse or electrically.

HEITZMAN SAFETY BLASTING PLUG CORP.
Shamokin, Penna.

JEFFREY SWING HAMMER PULVERIZERS



will give you dependable day-in-and-day-out service reducing limestone — shale — slate — clay — chalk — marl — gypsum — phosphate rock — asbestos rock — and many other products.

Write for Catalog No. 550-G

The Jeffrey Manufacturing Co.
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KERN RADIAL STORAGE SYSTEMS
FOR
ECONOMICAL PRODUCTION AND STORAGE OF STONE, SAND AND GRAVEL

Every System Designed and Engineered To Suit Your Requirements

NOW POSSIBLE TO MEET DEMANDS FOR BETTER MATERIALS AT LOWER COSTS

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Only the SELECTRO by JIGGER

GIVES YOU A VIBRATING SCREEN WITH—

1. Selective Vibration, Throw
2. Full Tilting
3. Full Circle Throw
4. Oil—Not Grease—Lubrication
5. Ruggedness, Low Operating Costs

Send for new data book on screening

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PRODUCTIVE EQUIPMENT CORP.
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SHOVELS-CRANES-CLAMSHELLS-DRAGLINES

A TYPE AND SIZE FOR EVERY JOB

Lima Locomotive Works, Incorporated
SHOVEL AND CRANE DIVISION
Lima, Ohio, U. S. A.

DRAGLINES—FOR SALE

1—Model 6 Northwest Twin City engine, 50′ boom, long crawlers, 1¾ yard bucket.

2—One-yard Bucyrus-Erie-Waukesha engine, 40′ boom, 1 yard bucket.

3—K-44 Link Belt-Waukesha engine, 60′ boom, 1½ yard bucket.

E. F. MARSH CO.
4030 Chouteau
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TO BE SOLD AT PUBLIC AUCTION
ON
THURSDAY, DECEMBER 3, 1936, 10 A.M. C.S.T.
AT THE PLANT FORMERLY
SEAMAN DUNNING CORP.
PINE BLUFF, ARKANSAS

Containing Late Type, Ball Bearing, Motor Driven Woodworking Machinery

60 H.P. General Electric Synchronous Motor 3 phase, 60 cycle, 440 volt, 900 RPM.
100 H.P. General Electric Synchronous Motor 3 phase, 60 cycle, 440 volt, 900 RPM.
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ALL EQUIPPED WITH BUILT-IN EXCITERS AND STARTING EQUIPMENT
About 400 Tons of 35-lb. re-laying Rails.
18 Dry Kilns—Each kiln equipped with about 10,000 ft. 1″ and 2″ pipe
95 KW Frequency Changer G.E. 60/120 cycle.
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122 East 42nd St.
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$3,000 to $30,000

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7016P Euclid Avenue **Cleveland, Ohio**

FOR SALE

1—Marion 450 1¼ yard diesel-electric shovel-crane, trench hoe.

1—Plymouth 4-ton 24″ gauge gasoline locomotive.

5—Easton 24″ gauge 40 cu.ft. 2-way rocker dump cars.

1000 ft. 24″ gauge portable track.

1—8″ steam driven Morris centrifugal dredging pump.

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SURPLUS EQUIPMENT AT LANNON

2000 ft. 20-lb. Industrial Rail.
1 Chicago-Pneumatic Air Compressor 8x8 No. 9633.
1 Tank 5′0″x2′6″.
1 20 H.P. slip ring Gregory electric motor 240 volts, 60 cycles, 720 R.P.M. with control.
1 Fabricated Steel Boom 66′6″ long.
1 Steel Boom for Bucyrus-Erie 20B Shovel, 36′6″ long.
1 Steel Hopper 9x12′.
1 Bull Wheel, complete with braces, 6′6″ diameter.
1 Bull Wheel, 2′9″ diameter.
1 Bull Wheel, 8′0″ diameter.
2 Sets Heavy Stiff Legged Derrick Irons. 12x12 Base.
1 Bucyrus-Erie Shovel mounted on caterpillar tractors with one-half yard dipper. In A-1 condition. New flues.

Lannon Quarries Corporation
414 North Spring Street
Beaver Dam, Wisconsin

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6″ Traylor Crusher with TZ Mantle.
No. 49-S Kennedy B.B. Gearless Crusher with synchronous motor.
Telsmith No. 3F. Reduction Crusher.
36″x6″ & 48″x36′ Farrel Jaw Crushers.
No. 4½ (20x10) Champion Crusher.
60 ft. Guy Derrick Handling Outfit with 60 HP Gas Hoist.
1 yd. Sauerman Elec. Slackline Outfit.
1 J&C Lime Hydrator.
Smooth Face Rolls 36x16 & 30x10.
1¼ yd. Marion Electric Cat. Shovel.
Pennsylvania S-7 Hammer Mill.
Williams Jumbo No. 4 Hammer Mill.
6′x55′ Rotary Dryer.
Tube Mills: 7′x22′, 7′x10′, 5½′x20′, 5′x22′, & 5′x18′.
No. 6 Austin Gyratory Crusher.
30″ Griffin Mill.
42″ Fuller Lehigh 4 Ball Mill.
¾ yd. Marion Electric Shovel.

TIDEWATER EQUIPMENT & MACHINERY CORP.
875 Sixth Avenue **New York, N. Y.**

FOR SALE

A going business. Several acres of land on which is located an excellent stone quarry, fully equipped with modern machinery. One Telsmith No. 3 Primary Breaker; one New Holland roll; screens, conveyor, 240 ton capacity bin, power plant, scales and shop. Orders on hand to maintain capacity production throughout this season. An ample market for crushed stone and commercial lime. If interested address **JOHN C. CASHMAN**
119 Library Ave., Wilmington, Ohio

FOR SALE

In order to dissolve partnership, we will sell the Maunie Sand and Gravel Company, which consists of: four barges, one derrick boat, one 8 in. digger boat, one tow boat, one caterpillar crane, one three hundred foot conveyor belt and a two hundred fifty foot railroad track. The concern is doing full capacity business at the present time with plenty of contracts to run for a long time.

Maunie Sand and Gravel Company
Maunie, Illinois

FOR SALE

1—35 ton McMyler Locomotive Crane.
1—30 ton Whitcomb Gas Locomotive.
3—12 ton Whitcomb Gas Locomotives.
1—1 yd. Koehring Gas Crane.
1—¾ yd. Osgood Comb. Shovel-Crane.
1—½ yd. Byers Comb. Shovel-Crane.
5—Clamshell Buckets ½ to 1½.
1,245 ft. Ingersoll-Rand Compressor.
450 ft. Ingersoll-Rand Compressor.
1—100 HP. Elec. Dragline Hoist, 2 yd. bkt.
5—Jackhammers.
1—Crane attachment for Marion 32 Shovel.
1—4½ x 6 Swinging engine.

J. T. WALSH
Brisbane Building **Buffalo, N. Y.**

A. C. MOTORS—60 Cycle—3 PHASE

Hp.	Type	Speed
600	G. E. Sl. Rg.	257
600	G. E. Sl. Rg.	705
600	G. E. Syn.	257
600	Al. Ch. Syn.	450
500	G. E. Syn.	1200
500	West. Syn.	720
450	West. Sl. Rg.	875/700
400	West. Syn.	720
400	West. Sl. Rg.	514
400	G. E. Sl. Rg.	885
300	Al. Ch. Sl. Rg.	585
250	G. E. Sl. Rg.	257
250	West. Sl. Rg.	700
250	F.MorseSl.Rg.	1200
225	Elec.Mchy.Syn.	450
225	G. E. Sl. Rg.	1800
220	G. E. Syn.	600

MOTOR GENERATOR SETS

1500 KW. G.E. D.C. GEN., 275 V. comp'd interpole, conn. to: 2500 HP. Syn. Motor Type ATI, 11,431/6600 V., 360 RPM., 3 ph. 60 cy. 1000 KW., G.E. Type MPC, D.C. Gen., 250 V., conn. to: 1400 HP. synch. motor, 6600/2300 V., 514 RPM., 3 ph., 60 cy.

CENTRIFUGAL PUMPS

2500 GPM.—59′ hd. dir. con. to 150 HP. G.E. 1750 RPM. 440 V.-3 ph. 60 cy.

Above are a few of our stock items.

BELYEA CO., INC.
153 W. 18TH ST., NEW YORK CITY
REBUILT GUARANTEED

Johnson 50 HP Locomotive Boiler, 125 lbs.
Portable Air Compressor, 160 CFM., Gardner.
Ingersoll-Rand Compressor, 2-stage Belted 446 CFM.
Schramm 15 HP Electric Compressor, 120 CFM.
Hayward 1-yd. G Clamshell Material Bucket.
Owen ¾-yd. Clamshell Material Bucket.
Centrifugal 8″x6″ Water Pump, 22 HP. A.C. Motor.
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1—Link Belt Model K-1 crane, shop No. 1024, 50′ boom, 1-yd. bucket.
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1—Byers Bearcat crane, Model 26, Ser. 30474, half circle swing, ½-yd. bucket.
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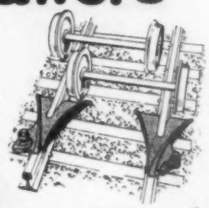

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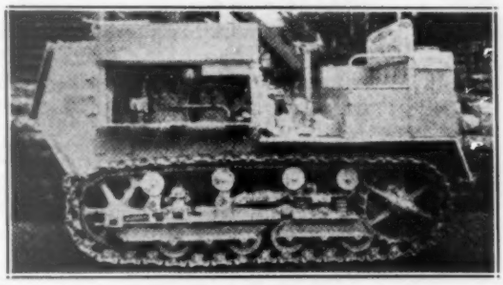

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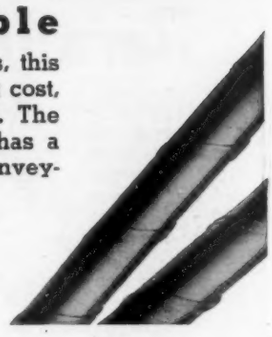

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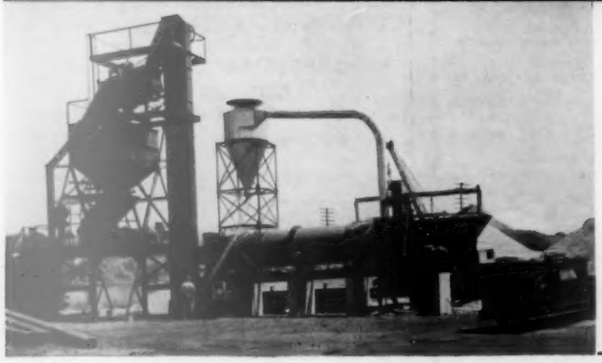

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